

LECTURES

ON

THE THEORY AND PRACTICE

OF

SURGERY.

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BY JOHN ABERNETHY, F.R.S. &c.

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Nous perdriens une grande partie de notre savoir si nous pouvions être  
delivré tout à coup de tous nos erreurs.

PIBRAC, *Mém. de l'Academie Royale de Chirurgie.*

The increase of knowledge is not like that of other things; being often  
accompanied by a considerable diminution in bulk.

## PREFACE.



If a person educate himself with a view to become a teacher in any department of science, he endeavours to collect, by reading, all the scattered knowledge that has been obtained ; to acquire by his own observations and experiments additional information ; and to arrange and display the whole of his subject in a perspicuous and impressive manner. Should certain portions of his lectures seem worthy of general attention, he progressively publishes them ; and some of the most instructive books in our profession, as they were the result of long-continued meditation and inquiry, have been thus produced. But who would labour in this manner, under the persuasion that the fruits of his exertions might be surreptitiously taken from him ? If this be permitted, it must put a stop to such efforts, and materially impede the progress of science.

When the lectures of certain teachers, as of Boerhaave, Cullen, and Black, had acquired a high degree of celebrity, they were indeed surreptitiously published by persons who were naturally ashamed to acknowledge their acts ; it has, therefore, been left to the present era to produce a character, in the editor of a periodical publication called the *Lancet*, so devoid of all good feeling and all sense of shame as to avow and defend conduct so unprincipled.

Whilst the lectures continued in the *Lancet* only, I was content, feeling assured that work would gradually sink into contempt and oblivion ;\* but when another person extracted and

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\* I did, indeed, from motives of public justice, and at the requisition of several of my professional friends, apply for an injunction against the publication of my lectures ; but the injunction being removed upon a subsequent application of the editor of the *Lancet*, I did not urge its continuance, and for the reason stated above.

published them as a separate book for his own profit, and seemingly without my disapprobation, I immediately sent to one of the periodical publications my disavowal of the work, with a pledge to publish my own notes of my lectures on those subjects treated of in the *Lancet*. This was in the spring of 1828; and when, in the autumn of the same year, I received from Boston in America a second reprint of these lectures, from the *Lancet*, I was induced to adopt measures to hasten the present publication. Such, however, has been the state of my health, that I could not have accomplished this object, even at the present time, without the kind assistance of Mr. Willis, librarian to the Royal College of Surgeons in London.

It was always my design to publish some account of my surgical lectures, because I thought attention to what I regard as principles of practice, and which are particularly inculcated in these lectures, might be of the same use to others, that, I believe, it has been to me in the treatment of diseases. I have endeavoured to render the work as brief as possible, and by referring to my *Surgical Observations* for information upon all the subjects treated of in them, I have avoided repeating any thing that is already before the profession. It is the doctrinal part of surgery, and the arrangement of its subjects, which I am now chiefly desirous of submitting to general attention, that they may be considered, and approved, or rejected; for these are the points, if I am not mistaken, which have rendered my lectures interesting to the public.

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<sup>1</sup>The pages given in the notes, refer to the *London* edition of *Surgical Observations*.



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# LECTURES ON SURGERY.

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## SECTION I.

OF THE DISTURBANCES OF THE SYSTEM IN GENERAL WHICH  
ARE PRODUCED BY LOCAL AFFECTIONS.

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### CHAPTER I.

MEDICINE, or that science which has for its object the prevention and cure of diseases, is in its nature one and indivisible ; but custom has separated it into two parts, one of which is surgery. Surgeons are generally consulted upon external diseases, which are supposed to require topical applications for their cure ; upon diseases, internal as well as external, which require operations ; and upon all diseases produced by the injurious effects of external causes, which require topical applications, mechanical contrivances or operations.

But as local disease, injury, or irritation, may cause a disturbance of the whole system, it is right, in the first place, to inquire into the nature and treatment of the general affections that are apt to be so induced.

§ 1.\* Local disease, injury or irritation, may produce more immediately pain, swooning, sickness, and rigors ; and more remotely, delirium and tetanus. They may also induce various febrile affections, with the consideration of the nature and treatment of which it is most convenient to begin.†

#### *Of the Sympathetic Inflammatory Fever.*

§ 2. If a healthy person be the subject of a serious accident, such as a compound fracture, and the state of the different systems composing the body be inquired into some time after its

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\* Certain paragraphs are marked with numerals for the sake of reference, so as to make repetition unnecessary.

† Mr. Hunter was the first scientifically to investigate the nature of these constitutional affections. To his work on the blood, inflammation, &c. I beg particularly to refer.

occurrence, the actions of the sanguiferous system in general are found to be augmented, whilst the secretions are diminished. The pulse is more strong, full, and frequent than usual; the skin is more hot and dry; the urine less copious and higher coloured than in health. If under these circumstances blood be taken from a vessel, it is found to coagulate slowly, and the crassamentum is buff-coloured and concave on its upper surface. The nervous system of the patient appears to be excited, and there is consciousness of strength. The patient is vigilant, or, if he chances to doze for a little, he awakes suddenly and completely. The functions of the alimentary organs are disturbed; there is in general no inclination for food, or if there be any, it is for such as is of a vegetable and acid nature; there is thirst, and the tongue is white and dry. The bowels appear to be deficient in secretion and are torpid. This state of disorder of the whole system generally subsides about the third day, at which time secretion is also usually established from the parts that have been injured.

#### *Varieties of Sympathetic Inflammatory Fever.*

§ 3. Although the same kind of fever results from inflammations subsequent to injuries of important and vital organs, yet the symptoms vary considerably from those just described. The pulse is neither so full nor strong, but it is more frequent than in cases where parts of minor importance to life are the subjects of injury. It acquires freedom and strength in consequence of bleeding, which lessens the inflammation of the affected organs. The blood is buffy and cupped; and although these appearances cannot wholly be relied on, yet they generally serve as a warrant to persevere in blood-letting, to an extent that under other circumstances would probably be destructive, with a view to subdue inflammation in vital and important organs. The state of the nervous system and of the digestive organs may also vary considerably from that which has been described as occurring in ordinary cases.

#### *Treatment of the Sympathetic Inflammatory Fever.*

§ 4. As the general disorder is the effect of a local cause, our chief attention should be given to mitigate the latter; indeed, the fever cannot be materially altered, whilst the cause producing it remains in the same state. The abstraction of blood is the most direct means of lessening the increased action of the heart and arteries; yet we should thus deprive the patient of his strength, of which he may afterwards stand in the greatest need. We are therefore only warranted to bleed, on account of the inflammatory fever, when the febrile actions, from

their excess, are likely to occasion more consequent debility than the loss of blood would produce. When vital or important organs are affected, we bleed to lessen the cause exciting the fever, and to prevent those local consequences of inflammation which would be destructive to life. (See Chap. IV. § 6.)

§ 5. As the secretions are diminished, (to which circumstance, probably, the fulness of the pulse is to be ascribed,) it is right to attempt to restore them to their natural state, and even to promote their increase. Indeed, it may be laid down as an axiom in the treatment of disease, that we should endeavour to correct evident errors in the functions of the different organs of the body, and to keep them in a state approximating as much as possible to that of health. By augmenting the secretions we also lessen the plenitude of the sanguiferous system, and consequently diminish its actions.

Saline medicines, with small but repeated doses of antimonial powder, are usually prescribed for the purpose of maintaining gentle perspiration; and it is probable that these remedies increase the secretions generally throughout the body.

§ 6. The bowels should be cleared and kept gently lax by saline purgatives. The discharges excited in this way are farther beneficial by producing depletion from the sanguiferous system. The food should be of an unstimulating nature, and should consist of vegetable substances. It should also be taken in small quantities, because the stomach will probably not digest much; and abstinence will likewise favour that depletion of the vascular system which tends to lessen excess of action without inducing such a degree of subsequent weakness as is occasioned by the abstraction of blood.

§ 7. The excitement of the nervous system does not appear to be tranquillized by opium; on the contrary, this medicine seems rather to augment the inflammatory febrile diathesis.

§ 8. After secretion has taken place from the injured parts, suppose in a case of compound fracture, and the fever has subsided on the third day, the system of the patient still remains disturbed, but in a different manner from that now described. The pulse is more frequent than in health, but neither full nor hard; it varies considerably in number at different times. Taking food and excitement of mind increase its frequency. There is a tendency to perspiration, and the urine is copious and limpid. The patient complains of languor and inclines to sleep. The tongue is moist, and the bowels are disposed to laxity. These symptoms are such as might be expected to arise from local irritation acting on a weakened constitution, and when aggravated and protracted they constitute hectic fever.



*Description of the Sympathetic Hectic Fever.*

§ 9. The pulse is at all times considerably increased in number, and there is a sharpness in its stroke that denotes irritation of the sanguiferous system. There is also a tendency to perspiration, which is frequently very profuse. In the advanced stage of this disorder, when the patient is reduced, the circulation on the surface of the body being much diminished, the skin loses the softness and sleek appearance characteristic of health, and becomes harsh and rough. The urine is generally copious and clear, as in cases of nervous irritation; it is subject, however, to variations. The nervous system is feeble and highly susceptible; the patient's mind is despondent, and liable to be agitated by slight causes. Mr. Hunter observes, that the feeling of weakness is greater than the reality; for, although in many cases the patient seems extremely reduced, the constitution has still sufficient vigour, should an operation be required, to heal the large wound that results from the amputation of a limb. The tongue is moist and clean, and sometimes more red than natural; the appetite is deficient, the stomach flatulent, and digestion slow and imperfect. The bowels have a tendency to purging, which is often profuse.

*Treatment of the Sympathetic Hectic Fever.*

§ 10. We should endeavour to mitigate the cause of the disease by topical treatment, to moderate the general symptoms which the local malady produces, and to support the strength of the patient under this harassing and exhausting disorder.

Opium lessens the irritability of the parts locally diseased, and renders the system less susceptible of excitation. It should be given in uninjurious but adequate doses, and repeated at such regular intervals as may be found requisite to maintain its uninterrupted operation. When opium is thus administered, care should be taken to keep up the due actions and secretions of the bowels. The support of the patient's strength is chiefly to be accomplished by the regulation of his diet, and the exhibition of such medicines as give tone and tranquillity to the stomach.

Cordials are frequently beneficial, and do not increase febrile action. The Peruvian bark is very serviceable in irritable sores; and in hectic fever it may do good as well by its effects on the local disease, as by increasing the powers of the stomach, and giving tone to the system generally. Yet it is not to be relied on as a specific tonic, nor persisted in when



it disturbs the functions of the digestive organs.\* It deserves our observation, that the hectic fever will suddenly cease upon the removal of the cause. Persons who, from diseased joints, have been long kept without sleep, and who have scarcely been able to take any nourishment for a very great period of time, after amputation sleep soundly; and, when they wake, it is only to ask for food, and immediately to sleep again.

§ 11. When a compound fracture proceeds unfavourably, the wound assumes a different character. The discharge, which had before been profuse, diminishes greatly; the surface acquires a dusky hue, tending to mortification; and there is surrounding inflammation of an erysipelatous nature. With this change in the state of the injured parts, the febrile symptoms also assume a new character, which I am accustomed to describe under the title of

### *The Sympathetic Irritative Fever.*

§ 12. The pulse now acquires a degree of strength not to have been expected from the previous apparently reduced state of the patient, and is often very frequent. The skin is hot and dry, though sometimes there is profuse perspiration. The urine is scanty, and high coloured. The patient becomes delirious, and there is subsultus of the muscles. The tongue is dry, and covered with a dark brown fur; the stomach is flatulent, and the secretions of the bowels are commonly diminished, though sometimes there is purging: in short, the condition of the patient is so similar to that which occurs in an advanced stage of typhus, as not to be distinguishable from it, under which circumstances the fever might be called the sympathetic typhoid fever.

In some constitutions, when a lumbar abscess becomes open, or shortly after the infliction of an injury, a febrile affection suddenly comes on, very similar to these expiring symptoms, as they may be designated, of a much reduced and disturbed system. The pulse is very frequent; and I have counted 150 strokes in a minute. There is no sleep—the intellect wanders, and the action of the muscles is tremulous; the tongue is furred, brown and dry; the stomach is flatulent, and disposed to reject whatever may be taken into it. These symptoms are too violent to be denominated hectic fever; but as they decline in intensity, the disorder gradually acquires that type. In some constitutions, also, inflammation of an absorbent gland will

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\* Two physicians of great experience, Dr. Heberden and Sir Ed. Hulse, have declared that they never saw good done by bark in hectic fever, unless when the disease was accompanied by a wound. Vide *Medical Trans. by the Royal Coll. of Phys. in London*, vol. ii. p. 14.

produce great fever, restlessness, prostration of strength, and derangement of stomach. These symptoms generally soon subside; and though the gland may afterwards suppurate, the constitution is not again disturbed in a similar way. Local inflammations of a particular nature, as will afterwards be shown, disturb the constitution in a corresponding manner, and produce the train of symptoms I have just described; so that I am disposed to denominate every variety of these violent febrile disorders connected with weakness, by the same term—sympathetic irritative fever.

§ 13. The treatment of this form of febrile disease is to be conducted on the same principles as that of the hectic fever, § 10.

The irritative fever, however, does not, like the hectic, subside directly upon the removal of the cause which produces it. The following case will illustrate this remark:—A man between 40 and 50 years of age, had a compound fracture of his leg, in which a considerable portion of the tibia was knocked out, so that the upper and lower portions of the bone lay about an inch apart. As the limb could be kept steady in a proper position, hopes were entertained that the case might do well. Granulations were produced from the periosteum and whole surface of the wound; and as those which filled the space between the broken ends of the bone nearly coalesced, there was every reason to suppose that the event would be favourable. At the end of seven weeks, however, the patient was seized with a violent complaint in his bowels, when the granulations disappeared, leaving the chasm between the bones as great as at first. In his now reduced state of health the granulations did not grow again, or they reappeared in a trivial degree; and as his health declined, the wound fell into the state which has already been described, § 11., and produced irritative fever. The wound then sloughed, and the anterior tibial artery was laid open, in consequence of which he suddenly lost so much blood, that he fainted and seemed dead, for nothing that was tried could arouse him; and in this state I amputated his thigh, tied the principal vessels, and closed the stump. He was laid in bed, still completely unconscious. Volatile salts were applied to his nose, and the warming-pan was passed repeatedly over his body; at length he gave signs of returning sensation, the circulation was renewed, and warmth was restored. He was, of course, extremely reduced; but the same kind of febrile excitement, with delirium, still continued for three days, when it subsided. The wound, when opened, was found flabby, and for some time produced little or no discharge; the soft parts retracted, and although there had, at first, been a superfluous

quantity both of muscle and integument, the bone protruded; eventually, however, the man did well.

§ 14. Considerable variety in the nature of the febrile affections, which result from local irritation, may reasonably be expected, when it is considered that local disease, by its operation on the system in general, may bring on those affections to which there is a propensity, either in the constitution at large, or in particular parts or systems of the body. Paroxysms, like those of intermittent fever, are often induced by even trivial irritation of the urinary organs. I have known the same kind of local irritation bring on a violent fit of rheumatic fever, which confined the patient in a crippled state during three weeks to his bed, though the local excitement soon ceased.

Local irritation may disturb the constitution generally, and bring on disorders of organs predisposed to fall into a morbid state; but the chain of sympathies does not stop here; for the reaction of the local diseases, thus induced upon the system at large, often produces diverse and complicated results.\*

From what has been said of the origin and progress of the diverse sympathetic febrile affections, it appears that local inflammation produces a corresponding disturbance of the general system: thus, while local disease of a phlegmonous character continues, we have inflammatory fever; but on the former subsiding, in consequence of the occurrence of secretion on or about the third day, the latter also ceases,—the system, however, still continuing to be acted upon in a different manner; when, in conclusion, a kind of erysipelatous or irritative inflammation supervenes, another and corresponding kind of febrile affection ensues. This subject is farther elucidated by the circumstances that accompany the bursting open of lumbar and other large abscesses.† In these we regularly find that the accompanying fever acquires its character or type from the state of irritation and inflammation which takes place in the cyst of the abscess. We also observe, that when joints are exposed, and when vital organs are injured, if inflammation does not occur, (and such cases have happened,) no febrile affection of the system will follow. In continuing to study local diseases, we shall also be convinced that the state of the general health gives the character to the local affection; in one constitution we see local injury accompanied by inflammation of a phlegmonous, and in another, by inflammation of an erysipelatous character.

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\* In proof of these facts, I beg to refer to a case detailed in *Surg. Obs.* vol. ii. p. 99.

† See *Surg. Obs.* pt. iv. vol. ii. p. 148.



## CHAPTER II.

§ 1. LOCAL injury, disease, or irritation,\* may occasion pain, fainting, sickness, rigours, convulsions, delirium, and even insanity; and also produce tetanus at a more or less distant period.

Pain is the consequence of certain actions in the nerves propagated to the brain. These actions are commonly induced by injury or disease; but they may also take place spontaneously, and without any visible alteration in the structure or appearance of the parts where they happen, as is evident in the disease called *tic douloureux*. The cerebral actions so excited, and producing a sense of pain, sometimes cause a more extensive disturbance of the nervous functions, and sometimes exist, even in a great degree, without occasioning any ulterior effect. The latter circumstance is manifest in some cases of *tic douloureux* and toothache.

Fainting is the result of failure of the cerebral actions, and may occur in consequence of the direct propagation of disorder from any part of the body to the brain; or intermediately, in consequence of the stomach being first affected, and the brain sympathising with that organ.

Sickness may be induced by an affection of the cerebrum, or by a direct sympathy between the stomach and the part which is the seat of injury or disease. It often happens upon first passing a bougie, although no particular uneasiness is complained of in the urethra, that the patient feels slightly sick at the stomach, the action of his heart becomes feeble, the face grows pale, and, the head not receiving a due supply of blood, he faints and falls to the ground. If laid horizontally, the countenance almost immediately regains even more than its usual colour, and perfect consciousness returning, he expresses his surprise at what has happened. If, however, he be supported in a chair with the head erect, the faintness may continue for some time. Should cold water be given as he begins to recover, vomiting will almost certainly be excited.

Rigors probably arise from a sympathetic affection of the

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\* In addition to the general acceptation of the term irritation, I also use it to convey the idea of that undefinable disturbance in certain parts which we recognise by its effects; for instance, a worm, moving in the alimentary canal, or the passage of a bougie along the urethra, though unattended by pain, is known to produce general disturbance of the nervous functions, as fainting, giddiness, affections of the sight, &c.



stomach with local injury. They also occur upon changes of action in local diseases.

Convulsions seem to arise from the reaction of cerebral disturbance upon the muscular system. They are sometimes induced by the state of faintness which succeeds to venæsection. They also follow local irritation of various kinds, and in children are frequently produced by trivial causes. Persons when convulsed are generally without consciousness.

Injuries and operations, even of an unimportant nature, have sometimes produced an affection of the vital powers characterized by faintness and extreme languor; and persons have thus sunk and perished, no reaction of the system taking place.

Local affections sometimes bring on a state of delirium, which I have known, though very rarely, to occur without fever.

I have also seen several cases in which mechanical injury induced temporary insanity. In one instance, which followed a fracture of the leg, there was reason to believe that neither the patient nor any of his family had ever been subject to such a malady.

### *Tetanus.*

§ 2. Local irritation acting on the nervous system may produce spasms and convulsive motions of the muscles. These affections come on sometimes shortly after the receipt of a wound, but in this country more frequently at a later period, nay often when the wounded parts are in a healing state. The symptoms in either case are the same; but they are less vehement in the latter, and their succession is more distinctly observable. The muscles of the jaw become rigid first, so that the patient is prevented from receiving any thing into his mouth except liquids, and sometimes the contraction is so great that he is obliged to suck all his sustenance through some interval between the teeth, or the space that is left by the overlapping of the upper incisors; whilst, in other cases, the muscles of the jaw are never so much affected as to preclude the administration of sufficient food and of medicine. The muscles of the neck, back, and loins, are commonly next affected, those of the abdomen follow, and, lastly, those of the limbs, so that occasionally the whole body becomes rigid and inflexible. A sense of pain and dragging at the pit of the stomach is usually much complained of, and probably arises from the diaphragm being affected like the other muscles.

The muscles in this disease do not in general remain in a state of continued spasm, although this does occasionally happen, and for a great length of time; most commonly, the spasms abate more or less of their intensity, and return again in pa-

roxyisms; sometimes, too, the states of contraction and relaxation alternate so rapidly, that the attack rather resembles convulsions than proper tetanus. These varieties in the form of attack have given rise to the technical division of tetanus into tonic and clonic.

In some cases the disease increases rapidly in severity, and is destructive within a short time, whilst in others it continues without aggravation for a considerable period, and may ultimately get well.

In tetanus, the general functions of the sanguiferous and of the secerning system do not seem disturbed in any great degree. The pulse during the spasms is, however, accelerated; and the skin is usually covered with a profuse perspiration.

Neither are the functions of the nervous system greatly deranged in this disease. The senses are perfect, the intellect is clear, and patients slumber in the intervals of the spasms. To speak according to present physiological notions, the affection of the nervous system seems to be chiefly in those nerves by which in general the will exerts an influence over the muscles. Yet there is manifestly a kind of insusceptibility, perhaps in those nerves by which impressions are transmitted to the brain; for opium does not stupefy, nor does wine inebriate in the ordinary manner, those who are affected with tetanus.

In this disease the digestion is generally very imperfect. If wine be given, it speedily becomes tormentingly acid; it is also difficult to procure secretions from the bowels, the discharges from which are, so far as I have observed them, as faulty as possible.

### *Treatment of Tetanus.*

The treatment which has been instituted for the relief of tetanus is partly directed to the cause, and partly to the disease itself. When tetanus takes place at a remote period from the receipt, and during the healthy and healing state of a wound, it is reasonable to conclude that the disease, when once formed, may exist independently of the cause which produced it; and, therefore, it does not seem probable that amputation of the wounded parts would suspend the disease. When tetanus has occurred in consequence of a crushed finger, and the wound has still been in an irritable and sloughy state, I have repeatedly amputated the part; and I think the tetanus has been mitigated, though it has nevertheless terminated fatally; consequently, I should not think it vindicable to amputate an important member of the body, in the hope of arresting the progress of the disease.

It has been recommended to endeavour to produce a new action in the wounded parts: but escharotics and violent stimu-

lants are likely to make a bad wound worse ; and their application could only be justifiable on the supposition of some specific irritation causing the disease, — an opinion which is invalidated by the occurrence of tetanus when the wound is no longer irritable, but is even in a healing state.

From the earliest periods of medicine to the present time, practitioners have remarked on the general fatality of tetanus, and the inefficacy of remedies in its treatment. The disease occurs and gets well more frequently in hot than in cold climates. Attempts have been made to subdue it by the most copious bleedings,\* and by relaxants, such as the tepid bath, but in vain. Nevertheless it must be allowed that the tepid bath has occasionally seemed to mitigate the severity of the spasms. As tetanus is apparently brought on through the medium of the nervous system, it seemed likely that whatever induced a change in that system would have a beneficial influence upon the affected muscles. Opium has, therefore, been tried repeatedly, and to a great extent ; but, though it seems to relieve, it has not yet been found to cure the disease. It should be administered in the manner and with the views already indicated. (Chap. I. § 10.) We should also give the medicine in a form likely to act efficiently by being quickly dissolved in the stomach ; for great numbers of the opium pills which had been administered during life for the relief of the disease have been found after death unacted upon in the bodies of those who had fallen victims to its severity.

Mercury has been employed freely to produce a change in the general system of those affected with tetanus, but without avail ; for the insusceptibility of the patient prevents the medicine from having its ordinary effects. There have also been instances of persons in a state of salivation by mercury meeting with trivial accidents in hot climates, and dying of tetanus thus induced ; which leaves little hope of benefit being derived from a mercurial excitement of the system. Tetanus has been treated as if it were the consequence of debility, and tonic and stimulating remedies have been administered, but not with such success as might seem to warrant any confidence in this mode of treatment. Indeed, if copious bleeding and tepid bathing have been employed without apparent detriment in tetanus, it is not reasonable to suppose that the opposite plan of treatment can be decidedly beneficial.

When we do not know what ought to be done with a view to

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\* De Haen took twelve pounds of blood from a patient at eight bleedings within twenty-four hours, without producing any apparent alleviation of the disease.



relieve a disease, it becomes our business to endeavour to regulate the functions of the general system; therefore, if the heart and arteries were powerfully excited in a case of tetanus, it might be proper to take some blood, and, on the contrary, if there were languor and feebleness, we might feel it our duty to stimulate and strengthen. With respect to the treatment of tetanus by blood-letting, I think it right to observe, that as irritability seems to increase with debility, we should be cautious not to induce weakness by pushing this means very far; the more so, as the inability on the part of the patient to take food, or to digest it if he could, must operate as a continually increasing cause of weakness.

The affusion of cold water on the body was recommended even by Hippocrates; but he restricts the practice to cases of tetanus which do not proceed from wounds. The same mode of treatment has been advised by Dr. Wright\* of Jamaica, and Dr. Currie of Liverpool, even in tetanus brought on by wounds. We should, in adopting it, be cautious, that neither the degree of coldness of the water, nor the suddenness of its application, should materially aggravate the convulsive spasms at the moment of its use; for instances have been known of muscles being torn asunder, and even of death being caused, by an attack of spasm excited by the too sudden affusion of a bucketful of cold water. Cold, applied to the surface of the body, is well known to have a powerful effect upon the muscular system, and very generally, and very greatly, to diminish its actions. And it is certain that, by lowering the temperature of the surface, we may relieve tetanus for a time, though we may fail by this means in permanently altering the nature of the disease. Mr. Coleman, professor of veterinary medicine, caused a horse, which was violently affected with tetanus in the winter time, to be covered with snow, and the cold quickly rendered pliant and moveable his limbs, tail, and ears, which previously were rigid and fixed; but they soon became stiff again on the discontinuance of the application, and the disease went on unabated in intensity. Means which reduce temperature may, therefore, be useful in alleviating tetanic spasms, but will fail in altering the course of the disease.

We cannot reasonably look for the relief of nervous and muscular disorder whilst the digestive organs remain in an unhealthy state, and are not brought to perform their natural functions. Of late years I have seen several cases of tetanus relieved in proportion as the chylopoietic viscera were getting into a healthy



condition, and ultimately cured when this end was accomplished. These cases, I am firmly persuaded, would have terminated fatally under any former mode of treatment which I had ever seen adopted. To allay nervous inquietude in the alimentary organs, it is necessary gently to promote their secretions, and those actions by which their contents are propelled and discharged. It is, however, particularly difficult to accomplish these objects in tetanus, on account of the torpid state of the nerves generally, and the want of the ordinary co-operation of the abdominal muscles and diaphragm. Calomel and jalap, in the proportion of one grain of the former to ten of the latter, is the medicine on which I chiefly rely. It may be mixed with treacle and smeared over the tongue, even when the mouth is almost completely closed. It has no disagreeable taste, and when swallowed is quickly diffused over the surface on which it is intended to act. It may be given every second, third, or fourth hour, in a dose proportioned to the exigency of the case. Clysters may be employed in co-operation; and I have, in some instances, observed, that when free discharges could be procured from the bowels, the tetanic accessions were so much mitigated in severity as to make the continuation of opium scarcely necessary.\* The cases that have done well under this treatment, it must be admitted, are not numerous; for it is but of late years that I have thought and acted in this manner. When the bowels have been cleared, the purgative medicine should be continued in smaller doses, so as gently to excite their secretions without producing irritation. The powerfully purgative effects of the croton oil are likely, in the first instance, to aid us greatly in clearing the bowels of their foul contents in tetanus; but it will, nevertheless, be right to continue the calomel and jalap in smaller, but adequate doses, at regular periods, the intention being then to procure gentle and equable secretions from unhealthy organs. If the calomel disturbs the bowels, or the system, it should be omitted, and the purgative may be varied according to circumstances. As our object is to relieve nervous irritation in the organs concerned in digestion, so as to prevent them from occasioning any disquiet to the nervous system in general, we should be particularly attentive to the regulation of the diet, and to all those circumstances which I am in the habit of inculcating in relation to the management of the alimentary organs.†

In some cases of tetanus, traces of inflammation in the brain and spinal chord have been discovered after death. Such ap-

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\* See Surg. Obs. vol. i. p. 131.

† These are fully detailed in the first part of my Surgical Observations.

pearances, however, have not been visible in other instances. The inflammation must, therefore, be considered as an accessory circumstance, and not as the cause of the disease.

In tetanus, as in other affections not necessarily, nor constantly fatal, death may be induced by peculiarities of constitution, or by a temporary and accidental aggravation of the spasms ; several cases which were mitigated, and seemed to be going on favourably, have been fatally cut short by the intervention of a more than usually severe paroxysm of the disease.

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### CHAPTER III.

THIS chapter should contain an account of the more especial disturbances of the alimentary organs, and of their subsequent operation upon the whole system, in consequence of local affections ; yet, as this is amply discussed in my Surgical Observations, it does not seem necessary to consider it on the present occasion.

## SECTION II.

OF LOCAL DISEASES WHICH MAY OCCUR VERY GENERALLY THROUGHOUT THE BODY, AND WHICH SOMETIMES ARISE WITHOUT AN EVIDENTLY EXCITING CAUSE, AND SOMETIMES IN CONSEQUENCE OF INJURY.

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HAVING discussed the nature and treatment of those affections of the system which may attend upon local diseases, I proceed, in the next place, to consider the latter maladies themselves. I shall first describe those local diseases which occur very generally throughout the body, and arise sometimes without an evidently exciting cause, and sometimes in consequence of an injury. It is right to premise, that though, in local as in general diseases, the especial disturbance of one particular system is assumed as characteristic of the affection, yet that the whole of the vital energies are in every case more or less disturbed. When the sanguiferous system of a part is that which is especially excited, we call the malady inflammation. This varies in kind; and the first I shall treat of is the phlegmonous.

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## CHAPTER IV.

### *Of Phlegmon.*

§ 1. If a piece of glass be accidentally stuck in the skin of a healthy person, a considerable degree of swelling and tension speedily supervene, attended with heat, redness, throbbing, and pain. If the part thus affected be compressed, it feels firm and resistant. When the disease is of small extent, or affects unimportant parts, as in the case supposed, little constitutional disturbance is produced; but if it be considerable, or occur in parts essential to life, then a proportionate degree of sympathetic inflammatory fever arises.

In investigating the nature of inflammation by the aid of anatomy, we find that the whole of the structures composing



the part are affected: the arteries, nerves, and veins are all inflamed.\*

§ 2. The sudden swelling in phlegmon is in part the consequence of effusion into the interstitial cellular substance, but is chiefly to be attributed to the inordinate plenitude of the arteries. That such a state of the arteries does obtain, is proved by anatomical examination. Mr. Hunter, having excited inflammation in one ear of a rabbit, injected the head from the aorta, and found that the arterious trunks were one third larger in the inflamed than in the healthy ear, and that their branches were more numerously injected in the former than in the latter.

The throbbing that attends phlegmon is the result of this unusual plenitude of the vessels. It is synchronous with the pulse in other parts of the body, and is, therefore, consequent on the action of the heart. It sometimes extends to a considerable distance from the immediate seat of inflammation. In whitloes, and other painful affections of the ends of the fingers, for instance, the digital, radial, ulnar, and even brachial arteries, are sometimes felt to throb in an unusual degree.

The redness and sense of heat also admit of an explanation, from the unusual quantity of blood impelled into the dilated arteries. The actual temperature of an inflamed part does not, however, appear to be augmented beyond that of the internal organs of the body.†

The pain which accompanies the disease is aggravated during the pulsations, and has been said to depend on the distension of the arteries; but it has been shown that the whole of the structures, even the nerves, are inflamed in phlegmon,—in short, pain seems so natural a consequence of a violent disturbance in the functions of any part of the body, that I shall not repeat what has been said of its immediate cause.

It has been considered difficult to account for the firmness of parts affected with phlegmon. In some other kinds of inflammation pressure readily urges the blood from the arteries into the veins, so that the part becomes pale and yields beneath the fin-

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\* The affection of the veins is often known to extend to a considerable distance beyond the disease by which it was originally excited. The interior coat of these vessels is thickened and opaque, having lost its polished surface; a deposition of glutinous substance adheres to it, and obstructs the canal, into which pus is frequently secreted. These cases, in the earlier part of my professional life, were considered as rather rare occurrences, so that I have lately felt some surprise at the numerous instances of phlebitis and their apparent consequences that have been recorded. See Mr. Arnott's paper on the subject, in the 15th vol. *Medico-Chirurg. Trans.*

† See Mr. Hunter's experiments in his work on the Blood, Inflammation, &c. p. 290.

ger. But the bulk of phlegmon, which, as I have said, is greatly owing to the distension of the arteries, cannot readily be reduced by pressure; a circumstance which seems to indicate that there is a difficulty in the transmission of the blood from the arteries into the veins. The pulsating property of the arteries extends even to their minute ramifications, which in phlegmon are felt distinctly throbbing; yet microscopical observations induce us to believe that there is no pulsatory motion of the blood in the capillary vessels when the circulation is carried on in the ordinary manner; for the current from the artery into the vein is seen to flow in an uniform manner. It is reasonable to suppose, if increased actions of arteries be excited, that those vessels which pulsate naturally will contract with greater energy and relax more completely, and thus be disposed to receive a larger quantity of blood than usual from the impulse of the heart. It is likewise probable that the capillaries which do not naturally pulsate may, from excitement, become in a degree contracted so as to resist the ready transmission of the blood. Notwithstanding this contracted state of the capillaries, it is, however, I conceive, possible that more blood may actually circulate through an inflamed part, by means of its arteries of a larger size and susceptible of the pulsatory action, than passes through it in its healthy condition. The opinion of there being spasm or constriction of the capillaries in phlegmon, is confirmed by the suppression of secretion in glandular parts when affected with this form of inflammation. In that common malady, the ear-ache, with which almost every one is acquainted, and which has all the characters of phlegmonous inflammation, beginning by little and little, and increasing to a degree of violence almost intolerable, secretion is for a time suppressed, and when renewed, which it commonly is on a sudden, complete relief is afforded. We have frequent opportunities of observing the same circumstances in violent inflammations of other glandular parts. The opinion that the larger arteries are in a state of increased action in phlegmon is confirmed by the violence with which they bleed when divided. If a diseased part be removed when the contiguous structures are inflamed, we are astonished at the profuseness of the hæmorrhage, and the multitude of vessels which require the application of ligatures. That arteries can more forcibly propel the blood at one time than at another, and assume an hæmorrhagic action in particular parts, is rendered evident by the sudden injection of the corpora cavernosa and corpus spongiosum. The same opinion, of there being increased action of the arteries in phlegmon, is farther confirmed by adverting to the causes and to the cure of the disease. It is pro-

duced by irritation, *i. e.* by causes adequate to augment, and is cured by means calculated to lessen action.

*Modes of Termination and Treatment of Phlegmon.*

§ 3. If the cause of phlegmon be removed—if, for example, in the case which has been supposed, the piece of glass which stuck in the skin be taken away, the swelling may then subside, and all the symptoms recited gradually disappear. This termination of the disease is technically termed its resolution.

When the termination of phlegmon in resolution is wished or expected, the curative indications are, to remove or mitigate the cause, and to diminish the excited actions by means operating on the system at large, or on the part immediately affected.

The local means of allaying increased actions of vessels are, first, to lower the temperature of the part affected; second, to lessen the quantity of blood circulating through its vessels; third, to excite some new disease in the vicinity of the inflamed part.

§ 4. Heat to a certain degree is necessary to vital action, whether in vegetables or animals; it increases or diminishes these actions in every instance in proportion as it is raised above or reduced below the proper standard. This is proved by the influence of the returning spring and winter upon the vegetable world and on hybernating animals; it is also particularly evident in the effects of exposure to very low temperature upon the human subject, when the whole of the vital energies become so feeble and torpid, that people cannot resist the disposition to rest for a time, and in this state they perish. Heat, on the contrary, augments the vital actions. In those experiments that were made in a heated room by Mr. Blagden and others, the pulse and the respiration were astonishingly increased in frequency, and the whole body streamed down with perspiration. Heat combined with moisture seems, however, to have a different effect from dry heat. Within a limited scale, it is soothing to the feelings, and produces relaxation. This view of the subject shows the erroneousness of the common notion, that cold is bracing and heat relaxing. The feelings of vigour and elasticity that follow the cold bath are not produced by the cold water, but by the re-action of the system which follows its use. If we remain too long in the bath, we shall be convinced that its effects are the very opposite of bracing.

One of the most powerful means we possess of allaying inordinate action is, therefore, to reduce the temperature of parts, and this is best done by producing evaporation from their surface. In general it is not necessary nor warrantable to reduce the temperature lower than the natural standard. Evaporation.



which at first has relieved pain, being continued after the subsidence of the kind of inflammatory action which it was calculated to abate, chills the part unpleasantly, and, far from relieving, seems rather to cause uneasiness; it seems also to induce rheumatic pains; indeed, chilling any district of the skin is very apt to disturb the system generally. It is customary to speak of *cooling applications*, but I think that the expression, *means for the regulation of temperature*, would be preferable, as the principle upon which they are used would always be kept in view.

Linen folded and wetted in some evaporating wash is laid over an inflamed part, the temperature of which is then reduced by yielding the heat necessary to convert the lotion into vapour. But if the application be made under the bedclothes where the air being stagnant is soon saturated with moisture, evaporation goes on very slowly, and the wet linen speedily acquires the temperature of the surface to which it is applied. It is, therefore, necessary to expose the part whose temperature we would regulate to renewed strata of air. Wetting the surface of the skin, whilst it is freely exposed to the air, by passing a sponge dipped in common water over it at regular intervals, and thus maintaining constant evaporation, is one of the most powerful of all the modes of reducing temperature, except the direct application of ice or of freezing mixtures. The evaporation of æther or spirits is sometimes employed to produce temporary coldness. The temperature of parts may still be regulated by evaporation, even though the liquids employed are used of a comfortable warmth. Bathing surfaces of the body with tepid water is soothing to the feelings, and reduces temperature by the evaporation which takes place subsequently.

It is possible that the process of evaporation may have an influence beyond that of regulating temperature; it may affect the electricity of parts, and thus produce a change in their actions.

Watery poultices, without grease or oil, may be made to regulate temperature by evaporation. They are also soothing to the feelings of inflamed parts, producing, in the same manner as local tepid baths, a gentle state of perspiration which is often very beneficial. The pulp of bread poultice is on this account very useful, if the part to which it is applied can be kept well covered, for otherwise the evaporation might reduce the temperature in an unpleasant and injurious degree.\*

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\* This poultice should be made in the following manner: Scald out a basin, pour into it some actually boiling water; into this throw as much coarsely-crumbled bread, which ought to be in readiness, as will be required, and cover

§ 6. In phlegmonous inflammation of internal and important organs, where topical applications cannot produce much effect, we are obliged to rely chiefly on the abstraction of blood from the system as the means of lessening or removing the increased actions of the vessels. This it accomplishes partly by lessening their fulness, and partly by diminishing their power. In such cases, we are often under the necessity of bleeding the patient very largely; for if not arrested, we know that the continuation and progressive stages of the disease will prove fatal. Under these circumstances it is right not only to take blood largely, but to take it in a sudden manner. It may be proper to open even two veins at the same time, and whilst the patient is erect, with the view to produce fainting or a temporary cessation of the actions of the sanguiferous system; for reason and experience equally show that this has a great effect in checking inflammation. By pursuing this practice, we can save blood to the patient, as the disease is more controlled by its sudden loss and the consequent faintness, than by its gradual abstraction to a much larger amount. The inflammatory condition of the blood and the state of the pulse are our general warrants for continuing venesection. Yet these indications cannot in all cases be relied on. In inflammations of some of the most important parts, the pulse is often suppressed, and rises and becomes more full after every bleeding; a circumstance that shows the propriety of the means employed. It should, however, be borne in mind, that, under the influence of over-bleeding, the pulse will often acquire a morbid frequency and a throbbing beat; these are circumstances which are apt to mislead, and to conduct to the most fatal results.\* We should, therefore, be careful to distinguish between the increase of the pulse which, in the one case, is consequent on the relief of the local disease, and that re-action of the system which, in the other, is the effect of the excitement consequent on debility. It should also be remembered, that we are now speaking of the inflammation which results from injury, and not of that which

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the basin with a plate or saucer. Having waited till the bread has imbibed as much water as it can, (for there should be more water than is absolutely necessary,) drain off by means of the blade of a knife what is superfluous. The bread will then be in the state of a light and spongy pulp, and not heavy and pasty as when it is boiled. This pulp may be mashed a little with the edge of the knife, and is afterwards to be put out, one third of an inch thick, upon folded linen, and applied when of a comfortable warmth.

The water being gently expressed from this poultice, fresh vegetable juices, as of the carrot, the hemlock, or a solution of opium or hyoscyamus, &c. may be substituted in its stead, and thus it readily admits of being medicated when desirable.

\* See Dr. M. Hall's Medical Essays, 8vo. Lond. 1825; and Dr. Kellie's papers in the *Edinb. Medico-Chirurg. Trans*

arises from constitutional causes, which is often not to be cured by blood-letting, but on the contrary is benefited by an opposite treatment.

After general bleeding has been carried to a considerable extent, we have recourse to local bleedings and to blisters. We also endeavour to lessen the actions of the sanguiferous system by producing secretion from the bowels, skin, and kidneys, and farther, by using all the means which are known to have the effect of lowering the pulse, such as the removal or diminution of every kind of stimulus—by avoiding too much light, keeping the chamber cool, enjoining absolute quietude, and only allowing food in small quantities and of an unstimulating quality.

In phlegmon of unimportant parts, we rarely do more than regulate temperature by evaporating lotions, and keep the bowels in a gently lax state. It may be regarded as a general rule, that local inflammation is to be subdued by local measures, and that general bleeding should not be had recourse to, unless there be excitement of the sanguiferous system in general. Taking blood topically by leeches, and exciting a new disease in the vicinity of phlegmon of unimportant parts, are measures not usually resorted to, because the disease is violent in its nature, and if not speedily checked by the means suggested for the regulation of temperature, it hurries on to what is called its second termination, which is in *suppuration*.

### *Of Suppuration.*

§ 7. If phlegmonous inflammation be not materially mitigated by measures employed with the view of subduing it, the symptoms go on increasing in severity, until, upon a sensation of something issuing into the centre of the part affected, a sudden remission of their violence is experienced. This is the commencement of suppuration, — in other words, secretion is renewed, and the overloaded vessels are by this means disburdened. This change is sometimes denoted by a slight shivering fit, which is consequently regarded as indicating the formation of matter, when internal parts of the body are inflamed. When suppuration succeeds to phlegmonous inflammation of external organs, the tension and redness are seen to abate, and a softening in the centre of the part affected, indicative of the existence of a fluid, is perceived. This fluid quickly approaches the surface in consequence of the superincumbent parts being removed by absorption, and the collection becomes prominent in a pyramidal form; at last the skin is taken away in one or more places, matter escapes beneath the cuticle which gives way, and the contents of the abscess being discharged,



complete relief is afforded to the patient's sufferings. When an abscess forms in the fingers or toes, in the palm of the hand, or sole of the foot, unless a free outlet be made for it artificially, the matter is very apt to be effused under the thick cuticle that covers these parts, and to separate it from its connexions to a considerable extent around.

§ 8. The cavity of the abscess, when no longer distended with matter, contracts, and after a time produces a growth of new flesh or granulations from its sides, which fills it up to the level of the surface, and sometimes even protrudes through the opening in the skin. The disease having thus terminated, the newly-formed substance which fills the cavity is gradually absorbed, the thickening of the surrounding parts subsides, and they acquire, by degrees, their former texture, so that, in general, all vestiges of the disease are at length effaced.

§ 9. The cavity of the abscess is lined by a thin cyst, the inner surface of which is villous, and such as an anatomist would say was a secreting and absorbing surface. That it is actually so we know; for when absorption exceeds secretion, the abscess diminishes, and is sometimes entirely removed or dispersed, as, when secretion surpasses absorption, it comes forward, and when they exactly counterbalance each other, it remains stationary. The external surface of the cyst in phlegmon is walled in and supported by the agglutination of the surrounding cellular substance.

§ 10. The fluid which is contained in a simple abscess is healthy pus. In consistence and colour it resembles thick cream; it has little odour, is mild and unstimulating, and is very slow in putrefying. When examined by the microscope, pus is found to consist of a multitude of globules floating in a transparent liquid.

The absorption of the animal structures in a direction towards the surface, by which an outlet is given to matter, is not peculiar to abscesses, for it takes place in aneurisms and other diseases that distend the parts by which they are surrounded. Neither is the pyramidal form which abscesses assume when about to discharge their contents peculiar to them; it occurs in other diseases, and is the consequence of a relaxing process taking place in the surrounding skin.

#### *Treatment of Phlegmon when expected to terminate in Suppuration.*

§ 11. When the inflammatory symptoms increase instead of yielding to the repellent treatment which may have been instituted, applications that diminish temperature no longer afford relief, but seem rather to augment the patient's sufferings, which

are then usually most assuaged by the employment of a greasy poultice.\* Poultices of this description have no specific power in promoting suppuration; on the contrary, from the mitigation of pain which they procure, and the favourable change which, by their gentle warmth and moisture, they effect in the condition of parts, the inflammatory action sometimes subsides, even after the formation of matter, in which case the abscess disappears in the manner already stated, without making its way to the surface. The processes of nature in phlegmon are so completely curative of the disease as in general to render any interference of art detrimental rather than beneficial. The thin and diseased condition of the integuments when the abscess has burst renders them indisposed to heal till the cavity is filled up. It is only when we cut through a considerable thickness of integument in order to give outlet to matter, and thus relieve inflammation, that the wound is apt to close whilst secretion is still going on into the cavity of an abscess, in which event a second opening is frequently required. When the abscess has burst spontaneously, or its contents have been evacuated by the surgeon after they had nearly reached the surface, we do not find that the outlet is commonly disposed to heal prematurely.

*Of Phlegmonous Inflammation terminating in Mortification.*

§ 12. When the actions of phlegmon are excessive, and are not relieved by the occurrence of secretion, the living powers of the part affected may be so exhausted that it perishes. In this event the blood coagulates in the vessels, the temperature declines, the surface acquires a dusky hue, and portions of the investing cuticle are generally raised into vesicles by the effusion

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\* The poultice of linseed powder is that which is usually applied, and should be prepared in the following manner:—Scald out a basin, pour into it some boiling water, and add the linseed powder, gradually stirring it in with a knife, until the mixture becomes a thin tenacious pulp, much less consistent than is desired for application. Beat up the mass for a few minutes with the blade of the knife till it is perfectly smooth. The powder swells by absorbing the water, and the poultice soon acquires the requisite consistence. Turn out the mass upon folded linen, and put a piece of lard on its surface; clean the knife by drawing it across the edge of the basin, and spread the poultice a quarter of an inch thick to the extent required. The lard prevents the poultice from sticking to the knife, and becomes incorporated with the mass so as to prevent it from drying on the surface. The linseed poultice when well made has all the properties of a good cataplasm; it is extremely soft, moist, and smooth, and will remain so for twelve hours. The linseed should be ground into an impalpable powder, and it matters not whether the oil have been previously expressed or not when lard or oil is added in making the poultice. We may use camphorated mercurial ointment on the surface of the linseed poultice. It may also be rendered stimulating by the addition of spicy and aromatic vegetable powders. Some surgeons prefer a poultice made of equal parts of linseed powder and crumb of bread.

of serum beneath them. This incipient state of mortification is termed gangrene. The part which has perished is, by degrees converted into a black fibrous mass, technically termed a slough, in which no traces of its original organization are to be distinguished. At this stage the parts are said to be in a state of sphacelus.

When a part has mortified in this way, the blood is found to have coagulated in the larger vessels to a considerable distance around,—much more remotely, indeed, than we might at first have been led to expect. This is the reason that there is usually no hemorrhage on the detachment of sloughs, and when a limb has mortified, say the leg as high as the knee, and it is judged right to amputate above that articulation, that the operation is sometimes performed without the least subsequent hemorrhage. The main vessel is seen plugged up with a coagulum, and we only apply a ligature to it as a measure of security, because we do not know how far the plug may extend, nor what resistance it may oppose to the jet of blood above it.

§ 13. When mortification has ceased, the dead parts are detached by natural processes. The living structures that immediately surround the slough are first taken away from its circumference, and afterwards progressively from beneath it towards its centre. A chasm being thus produced, granulations sprout from the living parts, and the slough being thrown off, a common ulcer is presented to the view. These different processes may be best observed in the detachment of a piece of skin which has been destroyed by caustic for the purpose of making an issue. The celerity with which they proceed varies extremely: I have known a slough to be thrown off in eight days, and I have seen it adhere at its centre for nearly three months.

§ 14. Mortification, as a consequence of phlegmon, is to be considered as rather an unfrequent occurrence, and does not require any specific treatment. The living parts which surround those that have become gangrenous, and upon which alone our applications can have any influence, are all highly inflamed, becoming gradually less and less so as they are more remote; every application, therefore, should be of a soothing quality,—the linseed poultice should be continued, and the parts should be occasionally bathed with tepid anodyne fomentations. It is excess of action which has caused the mortification, and surely such remedial treatment only as is calculated to tranquillize can be admissible.

The division of the slough, however, is always of great use in lessening tension. But upon the farther treatment of parts in a state of mortification, the reader is referred to what is said under that particular head in chap. x.



## CHAP. V.

*Of Chronic Inflammation.*

As it is believed that phlegmonous inflammation arises from greatly increased actions of the sanguiferous system of parts, it is farther conceived that such actions may be variously altered in mode and in degree. Hence it is that we denominate many diseases of different characters and dissimilar tendencies by the same term, inflammation. I proceed to describe a disease in the first stage of which the vascular actions are considered to be only slightly augmented. From its nature and duration it is termed indolent or chronic inflammation.

§ 1. Slight mechanical irritation often occasions an augmentation of the bulk and density of parts which is of an indolent character and is attended by but a very slight increase of temperature. The same disease also occurs without any evident exciting cause. From anatomical examination and analogy we conclude that the increase of bulk and density are caused by the deposition of glutinous or some other new and peculiar matter in the interstitial cellular substance. We know that when glutinous matter is thus deposited, there is a disposition in the contiguous vessels to throw out branches, which ramify through it, and convert it into a new growth. This newly deposited and organized matter may by its increase so obstruct the natural circulation in parts, and disturb their general functions, as to induce active inflammation and suppuration. We see examples of this in glandular parts, which are first indolently enlarged, and afterwards suppurate. Such growths may also by their pressure occasion the removal of the natural structures in their vicinity, so as to be substituted in their stead, and present textures of entirely new formation. New growths, having less vital energy than original structures, are likely, when subjected to any extraordinary irritation, either to be removed by absorption or to perish. When parts, enlarged by new depositions, are exposed by ulceration of the skin, they in general partly slough and partly waste away.

§ 2. The occurrence of chronic inflammation without evident excitement, or the continuance of this form of malady after its cause has been removed, indicates that the patient is of an unhealthy constitution. In a disturbed state of health, increased vital actions, however produced, are apt to become peculiar and perverse. Such increased or morbid actions then induce diversity of secretion and organization, and give rise to a great variety of diseases, dissimilar both in their nature and

appearances. Some of these excite the surrounding structures to participate in their morbid actions, and thus spread by continuous sympathy. Parts enlarged by chronic inflammation may not, for a considerable length of time, evince any decidedly morbid disposition, and yet afterwards assume peculiarly diseased actions. The first establishment of chronic diseases gives no pain, and excites no alarm; yet they spoil the structure of parts, and lead to painful and formidable results. Diseases of this character, therefore, though in the beginning they appear unimportant, are often found to be peculiar and intractable, and sometimes even fatal in their tendencies. We are, consequently, required to use our utmost endeavours to disperse them in the very earliest stages of their appearance.

### *Treatment of Chronic Inflammation.*

§ 3. The improvement of the patient's general health is a principal object in the treatment of all chronic diseases, more especially of those which have peculiarly morbid characters. The objects of local treatment are, 1st, to diminish the increased actions of the part; and 2d, to promote the removal by absorption of the deposition which has caused its enlargement.

The modes of diminishing increased arterial actions do not differ, whether these be considerable, or only slight in degree. We may regulate temperature by procuring a slight evaporation from the surface, by bathing it occasionally with water, or by keeping it wetted with some unirritating wash. The application of the bread and water poultice during the night has appeared to me very useful. It is soothing, and produces gentle perspiration from the surface. Blood may also be taken from the vicinity of the diseased part by leeches or cupping. This will lessen the plenitude of the vessels affected, and diminish their action. Yet blood should not be taken so largely or so frequently as to weaken the health of the patient. It is in the event of increased irritation coming on, in parts affected with chronic inflammation, that the local abstraction of blood is most requisite and useful.

§ 4. Having by the pursuance of these measures greatly diminished, or entirely suspended, the increased actions of the part, the means which we next adopt, in order to promote the absorption of those matters which have been deposited and caused the enlargement, are of a slightly stimulating nature. These stimulating applications are never to be employed, until the actions which have caused the disease are controlled or suspended, lest they operate as excitements to the faulty actions of the vessels, and thus increase instead of alleviating the disease.

They are also to be discontinued if at any time increased actions in the sanguiferous system of the diseased part should recur.

The stimulants we employ with the view just stated are rubefacients, which slightly excite the skin; frictions with or without stimulating liniments, or with camphorated mercurial ointment, which we farther conceive to possess peculiar powers of promoting the functions of the absorbing vessels. We also excite a crop of pustules over the disease by means of the tartar emetic ointment or the vinegar poultice. We, farther, electrify the surface, or cause the fluid to pass through the enlargement in every direction. We apply permanent pressure; and we establish some new disease in its vicinity, to act as a counter-irritant. It should be observed, that whatever, in any degree, stimulates the skin, may act on subjacent diseases as a counter-irritant. In employing frictions we should be cautious not to recur to them too frequently, nor to use them so forcibly as to excite arterial actions in the disease we wish to disperse. The efficacy of frictions in promoting absorption is strikingly evinced, when they are employed to discuss the swelling which so frequently remains around joints that had been affected with disease, long after the malady has completely subsided. Their power is also very evident in the speedy reduction that may be effected by their means, of the swollen fetlocks of horses confined to the stable. Frictions appear to promote absorption by urging on the fluids in the vessels which perform this function; they seem also mechanically to excite the interior of the parts over which they are employed.

Electrifying the surface of the skin has, probably, the same kind of influence in relieving chronic diseases, as that which is possessed by stimulating means generally. Yet the effects of electricity upon the vital energies of the body seem to be more permanent than those produced by common stimuli. The sensations consequent on its application remain for some time after it is discontinued, and it occasionally produces pimples in the skin. Electricity can also be applied in a manner of which no other remedy is susceptible: it may be made to pervade every part of an internal disease in different degrees of intensity, and thus excite the various actions that are there going on. By the employment of the same means, therefore, we may cause one swelling to disperse and another to suppurate. In applying this means of promoting the absorption of the substances deposited, and perhaps organized, in the interstices of parts, by chronic inflammation, we should be careful not to electrify so long, so powerfully, or so frequently, as to excite arterial actions. The sensations which follow the use of the remedy



should not be considerable, nor continue longer than a few hours; neither should it be repeated until the parts have recovered from the previous excitation, and again become perfectly indolent.

Permanent pressure is of great service in promoting the absorption of the matters deposited in parts enlarged by chronic inflammation. It is also beneficial by giving support to the sanguiferous vessels, and thus preventing their distention, which would tend to keep up inflammatory action. Its advantages are strikingly displayed in the effect it produces in cases of swollen and ulcerated legs.

The diseases which we institute as counter-irritants are excited by means of blisters, setons, and caustic issues. The most lenient mode of blistering is to keep on the vesicating plaster till the blister is fully formed, and to remove it without taking away any of the cuticle, but merely evacuating the serum by a puncture; after which the part should be covered with a piece of soft linen spread with simple salve. When the irritation of one blister is abated we apply another to the adjacent skin, and treat it in a similar manner: and after having thus gone over the whole surface in the vicinity of the disease, we recommence upon that first selected for vesication. In patients, whose constitutions are not very susceptible, we may remove the cuticle raised by the blister, and keep up a discharge from the part by dressing it with savine ointment, or some other stimulating salve. Blisters, however, it is proper to observe, often produce a great degree of constitutional irritation, which may be more detrimental to the local malady than their operation as counter-irritants can be beneficial.

Setons in general produce but little discharge from the parts through which they pass, unless they are frequently moved, or imbued with some stimulating substance, and then they are apt to become very troublesome, or to occasion ulceration of the skin, when they drop out.

When the disease will evidently require the long-continued use of counter-irritants for its alleviation or cure, issues are indisputably the best of this class of remedies we possess. They may be kept open for any length of time with little trouble, either to the attendants or to the patient, and they are very rarely causes of disturbance to the constitution. Issues are made either by the application of the *potasa fusa* of the *Pharmacopœia*, or of a paste composed of *potasa fusa*, quicklime, and soft soap. The latter composition seems to me to afford the least distressing means of making an issue. Many layers of good sticking plaster should be made to cohere together till they form a mass, one tenth of an inch in thickness. In the middle of

this, let an aperture be cut of the form and size desired, and the plaster so prepared be then closely applied to the skin. The caustic paste is next to be placed upon the middle of another piece of sticking plaster, and modelled to the proper size and shape, and being placed within the aperture, which represents the issue, and in contact with the skin, let it be there secured with two or three cross straps. The pain which this application produces comes on by degrees, remitting when most acute, and again returning. Some patients assert that the caustic does not give more pain than a blister, and even children bear it without greatly complaining. After four or five hours have elapsed, the caustic and plasters are to be removed, and the part is to be well washed with tepid water, in order that no particle of alkaline matter may be left to blister and irritate the surrounding skin. Next day the part to which the caustic has been applied appears as a black and fibrous slough, which, separating by degrees, leaves a sore that is then kept from healing, by having foreign bodies, as peas or glass beads, placed round its circumference in the following manner: Let some small solid glass beads be strung upon strong thread, (a knot being tied between every two of them, so as to keep them a little way apart,) and placed in the circumference of the sore. Let a little common dressing be put in the area so as to prevent them from approximating, and some simple dressings upon a small compress of linen and a card be applied over them, and bound down with strips of sticking plaster. In a short time the granulations surround the beads, so that each lies in a separate little cell. Being an incorruptible material, they never require changing, the only care necessary being to prevent the narrowing of the circle; and this, if it should happen, may at any time be brought to its original magnitude by a slight application of the caustic potash.

The measures now described may be considered as pure surgery, being the local means of counteracting the progress of local diseases in cases where the skin is entire. My observations and experience induce me to place the greatest confidence in them. I believe them competent to arrest the advance of almost all chronic affections, not wholly dependent on bad health; but I am assured that their success depends upon their being well-timed. All inflammatory action should be put a stop to by quietude, favourable position, depletion, and regulation of temperature, before the stimulating plan is adopted. I could relate numerous instances of blisters producing the most injurious effects by being applied at too early a period, whilst after the means suggested have been premised, they are used with the most beneficial consequences. If we blister in pleurisy be-

fore any evacuations have been instituted, we aggravate the disease, if after bleeding, &c. we relieve it, as if by magic. Should a new attack of inflammatory action occur in chronic local diseases, we immediately discontinue the stimulating, and resume the antiphlogistic treatment. We should also constantly bear in mind, that by counter-irritation we create new diseases, which by their action may have a detrimental influence on the patient's health. I shall yet have to speak of the occasional ill effects of blisters. I have known instances of such irritability of constitution, that even the application of vinegar poultices round a diseased joint could not be borne; the patient was obliged, after the attempt, to lie in bed for many months, the joint being kept absolutely without motion, and covered with the pulp of bread poultice, under which treatment he got well.\*

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## CHAP. VI.

### *Of Chronic Inflammation producing distinct Growths or Tumours.*

As I have treated of this subject particularly in my Surgical Observations, to enter upon it here would only be to repeat what is already before the public.†

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## CHAPTER VII.

### *Of Chronic Inflammation producing Abscesses.*

FOR what I have been accustomed to deliver on this subject, also, the reader is referred to my Surgical Observations;‡ it is, however, necessary to add, in conclusion to what will be found there, that there are abscesses of a nature intermediate between the acute and the chronic, neither so violently active, and so quickly discharging their contents, as those which succeed to

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\* Cases in proof of these propositions will be found in the chapter on Diseases of Joints.

† Vide Surgical Observations. vol. ii. part ii.

‡ Vol. ii. part ii. p. 132



phlegmon, nor so indolent and slow in becoming open, as those which follow chronic inflammation. The general rule, in regard to the treatment of these abscesses is, that if they be enlarging in circumference, and not advancing to the surface, it is proper to open them; for in this way we prevent the extension of disease. If, however, they come forward without increasing in circumference, and the skin over them become thin, there is no necessity for interfering with the natural processes that are going on. I have sometimes opened absorbent glands in the neck which had suppurated, when I felt satisfied that the abscesses were not of a scrofulous nature, before the skin became materially diseased, with a view to prevent the loss of substance in the integuments and consequent scar, which it is the natural progress of the disease to occasion, and, as I think, with success; occasionally, however, the stimulus of the wound in unhealthy subjects has seemed to cause more ulceration and destruction of skin, than would otherwise in all probability have taken place. The wound made in opening abscesses should not be of greater extent than will suffice to give a ready outlet to their secretions, until the diseased actions have subsided.

Chronic and unhealthy abscesses are apt to become sinuses or fistulæ, which may be very slow in getting well. The openings of such abscesses have sometimes a disposition to contract and confine their secretions, in which event it becomes necessary to enlarge their apertures. These sinuous abscesses are also frequently laid open throughout their whole extent.

In the treatment of those diseases of parts in which excessive actions have weakened the vital energies, it seems right to suffer them to remain quiet for a time, in order that they may regain their powers, before we venture to employ stimulating means with a view to promote their recovery. The unhealthy state of a sinus prevents it from healing, but it will eventually close as this state subsides. We see that the long sinuses and large cavities left after the evacuation of lumbar abscesses, and the bursting of buboes, get well spontaneously though slowly. When we lay open sinuses at an early period, the wound is apt to ulcerate, and to degenerate into a sore that heals very tardily. When we open them at a more advanced period, they often do not produce granulations, and are very long of showing any disposition to close. It seems to me, therefore, best not to interfere, as they will ultimately heal of themselves, the sooner in proportion as the general system of the patient becomes healthy. Nevertheless, it must be acknowledged, that laying open sinuses, and injecting stimulating liquids into them, does occasionally accelerate their cure. There may be other circumstances than those now alluded to, which operate in

maintaining certain fistulous sores, as those about the anus, in an open state. To these, therefore, the foregoing observations do not altogether apply.

Some abscesses have their secretions lodging in them in consequence of their openings being situated unfavourably. It is, therefore, often thought proper to make what is called a depending opening; a practice, however, which has not appeared to me to be generally necessary or even advantageous. This is strikingly illustrated by the following case:—A boy who had a diseased hip-joint, accompanied with a large abscess opening on the fore part of the thigh, and from the cavity of which a large quantity of matter was pressed, upon every renewal of the dressings. As a probe could be passed so deeply into the abscess as to be felt distinctly at the back part of the thigh, on the outer side of the flexor muscles of the leg, it was judged proper to make a depending opening at this point; and I therefore cut down upon a director, introduced from the front aperture, till it appeared behind, and afterwards enlarged the wound with a curved bistoury to the extent of two and a half inches. This opening for a time prevented any lodgment of matter in the abscess; but being made through sound parts, it could not be prevented from healing, except by measures which might have greatly disturbed the general health of the patient. It was consequently suffered to close, and the secretions of the abscess then lodged nearly in the same quantity as before the operation; nevertheless the cavity contracted by degrees, and at length healed soundly.

With reference to the subject of abscesses, it ought to be observed, that there are cases in which they form, more as a consequence of some disturbance of the system in general, than of particular disease in the part where they occur. I have known them take place in succession, in divers parts of the limbs, of the trunk, and of the head. Their formation has been attended with different degrees of pain, which in some cases has been acute. These abscesses do not generally come forward like those which follow phlegmon; and I have, therefore, been in the habit of opening them with an abscess lancet, when they have immediately got well, as if all disease in the part had ceased with the discharge of the collected matter. Abscesses of this description do not seem to be critical; for I have known them form one after another, during a considerable length of time, and only cease when the patient's health had improved. A gentleman, whose nervous system and digestive organs were exceedingly disordered, was seized with sudden and severe pain in his hip, so as to be rendered quite incapable of moving, the slightest effort causing him great agony. A very large abscess form-

ed rapidly, which was opened, and a quart of matter discharged. The pain in the hip abated, and he felt a little better, though he was still so unwell that doubts were entertained of his recovery. The abscess shortly ceased to discharge, and the wound healed. After the lapse of about a week, a similar occurrence took place in the shoulder and upper part of the arm. The same degree of nervous pain did not, however, on this, as on the former occasion, precede the formation of matter, although the patient did still suffer much from local uneasiness. A great quantity of healthy pus was likewise discharged from this abscess, and, like the other, it also rapidly got well, after which the patient gradually though slowly recovered his usual state of health.

Sometimes abscesses which may be considered as critical, form at the conclusion of severe disturbances of the system attended with fever. In many cases uneasiness in the part where the abscess afterwards occurs has been observed antecedently to the general morbid disposition. The local pain and the irritation attendant upon the formation of the abscess greatly aggravate the constitutional disturbance, so that it becomes necessary to give issue to the matter, and bring the local malady to a crisis as speedily as possible, after which the patient recovers. It would seem as if the local affection relieved the general disorder by fixing and concentrating the morbid dispositions. Such abscesses do not speedily get well; and the continuance of the local disease seems then farther to serve as a counter-irritant to the more general malady, during the agency of which the patient gradually recovers his health.

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## CHAP. VIII.

### *Of Irritative Inflammation.*

§ 1. IN speaking of the different kinds of fever induced by the different states of the wound in a case of compound fracture, (chap. i.) I stated that when the patient's health became greatly disturbed, the wound which had been discharging abundantly ceased to secrete; that inflammation of an erysipelatous character then occurred in the surrounding parts; that the surface of the wound sloughed, and the mortification progressively extended, and that these morbid processes were accompanied



with irritative fever. In treating of lumbar abscesses,\* I have attributed the accompanying febrile affection to the kind of inflammatory action which occurs in the cyst; for the fever comes on sooner or later in different cases after the abscess becomes open; and when the inflammation possesses an irritative character, the attendant febrile affection is of a similar nature, whilst as this irritative condition subsides, and a more chronic inflammation supervenes, the fever acquires a hectic type. I have also seen, from some misconduct on the part of the patient, the irritative inflammation and consequent fever renewed.

The more I see the more I am convinced that it is the state of the health in general which gives the character to local diseases, and that these when established excite a corresponding disturbance of the system. In persons of susceptible and peculiar constitution, the prick of a clean sewing needle sometimes induces irritative inflammation of the absorbing vessels and tumefaction of their glands, when irritative fever of a most alarming kind takes place. Both the local and general disturbance may subside in such a case, and the patient may seem to be well, and yet be liable to a recurrence of the local as well as of the general affection upon any renewed or accidental derangement of the system at large:—A young lady, between 17 and 18 years of age, who resided in the house of an intelligent surgeon, had pricked her finger with a sewing needle, and three or four days afterwards, without any inflammation appearing near the wound, the absorbents inflamed in the front of the fore-arm, and inside of the arm in the direction of the axilla, where the glands became tumid. The skin which covered these vessels on the inside of the arm and upper part of the fore-arm was also inflamed. The patient became extremely unwell, being affected with nervous tremours and inquietude. The pulse was also very rapid; and considerable apprehension was entertained as to the event of the case. Under these circumstances I first saw her, and found that the tongue was exceedingly furred, and the actions and discharges from her bowels very irregular and faulty. I advised that she should be kept in bed, and have a bread-and-water poultice applied to the inflamed arm; but my chief attention was directed to the improvement of the state of her alimentary organs. Calomel and jalap were ordered to clear the bowels, and maintain them in a gently lax state. Effervescing saline draughts were given in the first instance, and afterwards dilute sulphuric acid. Under this treatment, in three or four days, the inflammation of the arm had completely sub-

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\* Vide Surgical Observations, vol. ii. p. 146.

sided, and she became moderately well. After a week had passed, however, probably from neglecting her bowels, she had a relapse, and the same symptoms reappeared though in a mitigated degree. From this she recovered under the same kind of treatment, and had not afterwards any recurrence of the disease.

Even in the case of a common bubo, I have seen the first inflammatory action possessed of an irritative character, and the patient attacked with fever of a corresponding kind. He may seem a stout and healthy young man, yet his pulse shall become rapid, there shall be great prostration of strength, total want of sleep, great anxiety, complete loss of appetite and flatulence of stomach, &c. This disturbed state subsiding, however, the gland may afterwards slowly suppurate without inducing any farther febrile derangement of the system. In cases of accidental injuries we sometimes also find irritative inflammation and its concomitant fever come on in the first instance. These may afterwards subside, and the case do well.

The application of acrid substances to exposed surfaces, as happens in dissection, produces inflammation in the absorbents. But the severe constitutional disturbance which often follows in these cases is to be attributed rather to the inflammation by which it is excited than to the qualities of the matter applied. That there is an acrimony in the animal matter which produces the inflammation is highly probable. I, myself, during the course of my life, have repeatedly had eruptions and fretful sores on my hands, as also, at different times, intumescence of the axillary glands occasioning temporary fever, but without any contamination of the system. Once, indeed, and only once, my constitution was affected by the absorption of something that proved to be a morbid poison.\* In these cases it is something amiss in the general health of the patient which leads to the establishment of irritative inflammation.

Dr. Butter of Plymouth has of late related a number of fatal instances occurring from mechanical injuries in the Dock-yard, similar in all respects to those which happen in consequence of the application of acrid matter in dissection.

In such a state of health as gives rise to irritative inflammation and fever, the disease is likely to spread chiefly in those parts which have most susceptibility, and least vitality; accordingly the skin, absorbents, sinewy structures, and common cellular substance, are found to be especially liable to be affected, and among these parts it seems to be propagated by continuous

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\* The reader may find some of the particulars of this case in a note in *Surg. Obs.* vol. i. page 60.

sympathy, but when we perceive the same disease occurring at a distance from the original wound, the intervening parts remaining in their natural state, it is reasonable to suppose that it is propagated by the absorbents. The irritative inflammation is also the precursor of mortification in many cases ; as the inflammation spreads, so does the sloughing extend.

The occurrence of irritative fever in such various instances shows that the specific affections of the system in general, which accompany local disease, cannot arise from any peculiarity in the parts affected, but must be owing to the nature of the affection itself.

§ 2. For as long as I can remember, I have been accustomed to speak of a kind of inflammation which is not phlegmon, and which, though it in many respects resembles erysipelas, yet ought to be distinguished from it. This peculiar form of inflammation is characterized by vehement action with little power, and affects the system in a corresponding manner, occasioning irritative fever. I have been in the practice of describing the disease under the title of Irritative Inflammation ; for I think we may discover a similarity in the affections of the sanguiferous and other systems composing the body, whether the diseases occur locally or generally. As in general disturbances of the system we have inflammatory, slow or hectic, and irritative fevers, so locally we have phlegmonous, indolent or chronic, and irritative inflammations.

Though the irritative inflammation may terminate in resolution, and in suppuration, yet as its actions are excessive, and its powers weak, it is most apt to end in mortification. When of late years I have read of *diffuse inflammation* and of *phlegmonous erysipelas*, it has appeared to me that others had seen the necessity for some such distinction as I had been accustomed to make.

In phlegmon the disease is limited by surrounding adhesion. Erysipelas and irritative inflammation are not circumscribed in this manner, and they are liable to spread ; but the distinction between these two inflammatory affections will be best understood when erysipelas has been particularly described.

### *Treatment of Irritative Inflammation.*

§ 3. The objects of treatment here are to sooth both local and general disturbance ; and every means that may be thought conducive to these ends ought to be sedulously employed. The former requires the most perfect quietude, or motionless state of the diseased parts, and a position favourable to the return of the blood from the overloaded vessels. The patient should, therefore. be confined to his bed ; and the pulp of bread poultice



made with poppy water, or whatever else is found to give most relief, should be applied over the parts affected. When irritative inflammation occurs in consequence of injury, or otherwise, as soon as suppuration or mortification is perceived to have taken place, the parts ought to be laid open, in the one case to permit the immediate escape of the pus, and prevent the extension of the abscess; in the other, to take off tension, and to allow of a drainage from the cellular tissue, which produces the same effect, and also permits continued secretion to take place; thus relieving the turgescency of the vessels, concentrating and bringing the diseased actions to a sort of focus, and, like an issue, operating as a counter-irritant. Blood-letting, which so greatly reduces the strength, should as much as possible be avoided. It may here, as in some fevers of the adynamic kind, seem to produce temporary good, but it is ultimately detrimental. In those acute inflammatory affections which are excited by injuries and operations, and in phlegmonous inflammation generally, we bleed largely, and successfully; but there are many inflammations induced by morbid states of the system, in which the abstraction of blood is injurious. Every experienced surgeon must have met with cases of inflammation occurring in different parts of the body, which were decidedly relieved by tonics. I suspend the farther consideration of the treatment of irritative inflammation until I have discussed some other forms of inflammatory disease.

#### *Of the Erysipelatous Inflammation.*

§ 4. When erysipelas occurs in the superficial parts of the body, the skin is very red, in consequence of the minute vessels being turgid with blood. The redness, however, is dispersed by a very slight degree of pressure, the passage of the blood from the arteries into the veins being free. There is tumefaction, from effusion into the subjacent cellular substance, a circumstance which also shows that there is no obstruction in the capillary vessels. There is but little pain or throbbing, from which it is inferred that the minute vessels are the parts chiefly affected. The relative temperature of the inflamed surface is augmented, and the circumference of the disease undefined. The absence of circumscription, probably, explains the facility with which this kind of inflammation spreads. I have known it extend, having in the first instance been induced by the irritation of a ligature upon the spermatic artery, first up one side of the trunk of the body, then across the upper part of the chest and down the other side, and continue its progress along the thigh and leg even to the foot, the parts first affected getting well successively.

as the inflammation travelled onwards, and occupied a new district.

In general the erysipelatous inflammation subsides, or terminates in resolution. Pus is, however, frequently collected beneath skin that has been the seat of the disease. When the actions of erysipelas are violent the disease may also terminate in mortification.

§ 5. Erysipelas, when it comes on spontaneously or without an evidently exciting cause, is indicative of a disordered state of health. In this case it is improper to attempt the cure of the disease by local measures, for it may shift its situation and affect some other part, or its disappearance may be followed by an affection of some of the internal and important organs of the body, which may endanger the patient's life. When erysipelas supervenes upon some local irritation it equally indicates a disordered state of health; but in this case, if the disease yields to local remedies, which may here be very properly employed to prevent its extension, I have not seen any instance of metastasis, or of affection of a vital organ ensue.

#### *Treatment of Erysipelatous Inflammation.*

§ 6. The cure of erysipelas depends upon correcting that state of health which gives rise to this peculiar form of inflammation. That there is such a peculiarity of health in this disease is a fact generally acknowledged; and that one of its principal features consists in a state of disturbed function of the alimentary organs has been remarked by surgeons of admitted ability. We should, therefore, use every means to put the digestive organs of the patient into a tranquil and healthy state, and thus allay the irritability and general disturbance of the system. Desault has asserted that the tartrate of antimony, which seems to induce secretions from the alimentary organs, and from the capillaries generally, whilst at the same time it lessens vascular action, is eminently useful; and indeed it may be observed, that erysipelas manifestly declines under its use, when administered in repeated but small doses, as one third of a grain every 4th, 5th, or 6th hour. As the disease is connected with weakness, even this medicine should be used with caution. The pulp of bread poultice, when local measures are available, and when the patient is in bed, appears to soothe the parts affected, and to abate their inordinate actions, better than any other application.

I am in the habit of illustrating the subject of erysipelas by the recital of the following case:—

An army surgeon, a man of uncommonly vigorous constitution, was seized with fever whilst attending the troops at Walcheren, which left him in a very bad state of health. and with

great disorder of the digestive organs. Nearly two years afterwards, having business in London, he took up his abode at a hotel in St. James's Street. Here he was attacked with erysipelas in his left side from opposite the 6th rib to the crista of the ilium. The inflammation suddenly disappeared, and he became delirious. On the second evening after this occurrence the inflammation re-appeared in the side, and he regained his senses, but was unable to speak, and scarcely able to swallow. He requested in writing that I might be sent for. I found him with his tongue swollen, thickly furred, and indented with the marks of his teeth. The discharges which had been procured from the bowels were black and extremely offensive. I recommended that he should take half a grain of calomel with six of jalap, mixed in treacle, every 5th hour, until his bowels discharged sufficiently. Several free evacuations were thus procured during the night, and next morning I found him sitting up, and able to speak and to swallow with ease. A physician now attended, and prescribed medicines to allay fever, gentle laxatives, and alterative doses of mercury. The patient gradually recovered, and the erysipelas in his side subsided, so as no longer to attract his attention, till about a fortnight afterwards, when he perceived a prominence of the skin caused by an effusion of fluid beneath it. I opened this abscess with a lancet at the lower part, and gave issue to about twelve ounces of healthy pus: a linseed poultice was applied, and the abscess soon got well.

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## CHAP. IX.

### *Of the Inflammation which produces Furuncle, Carbuncle, and Anthrax.*

§ 1. THESE affections have a great resemblance to each other in their nature and consequences, and may all be considered as varieties of the same disease. The furuncle, or boil, is the most common and least important form in which the malady occurs.

#### *Of Furuncle.*

§ 2. The skin in furuncle is affected over a small district with an irritable inflammation, which is very susceptible of aggravation by mechanical excitement, and is accompanied with pain resembling that produced by heat. The cellular membrane, subjacent to the affected skin, becomes swollen, so that the part projects. The disease, if not provoked, soon becomes station-



ary; the skin then ulcerates in one or more places, and an opening is formed, through which a mass of sloughy cellular tissue infiltrated with pus presents itself, and may be expressed. The diseased actions in the skin now subside, and the sore which had formed heals rapidly.

From this history it appears that the inflammation in furuncle is of a specific nature, and tends to cause the death of the parts it affects: the skin escapes, most probably in consequence of possessing a higher degree of vitality than cellular substance. The disease occurs most frequently on the face and front surface of the body, and chiefly in persons before the middle period of life.

### *Of Carbuncle.*

§ 3. The carbuncle most commonly occurs on the back surface of the body, and in persons beyond the middle period of life. The patient has usually his attention first called to the disease by a sense of stiffness and uneasiness in some part of the skin. This feels thickened to the touch, and soon acquires a dusky red colour. From the part first affected, the disease spreads with greater or less rapidity in different cases, in an oval or circular form, the integuments, as it advances, assuming a still more intense dusky purple hue, and becoming very thick and brawny. This inflammation is also accompanied by a sensation of heat. The skin next ulcerates in several places, but the openings formed are commonly of small extent, and the discharge, which not unfrequently consists of healthy pus, is not copious; sometimes the subjacent cellular substance is found to have sloughed. Occasionally the integuments slough about the middle of the carbuncle, or where they are most affected; and when in this way a considerable opening is formed, when the tense and indurated skin is thus loosened, and a free discharge from the subjacent parts is allowed, the progress of the disease is arrested. The carbuncle, therefore, extends till, by nature or art, an opening is made adequate to remove tension and permit a free discharge to take place from the structures affected. The apertures formed by the ulcerative process are generally insufficient for these ends, and consequently do not prevent the disease from spreading, which, by its progress and the febrile irritation it occasions, is then apt to destroy the patient.

### *Of Anthrax.*

§ 4. The examples of anthrax which I have met with have occurred in the side of the neck and in the axilla, where the disease appeared to begin in the absorbent glands. A large

and very firm swelling was gradually produced, and the skin acquired the thickness, induration, and dusky purplish hue of carbuncle. Great constitutional disturbance attend the progress of the disease, and the patients died before the occurrence of any crisis. It was, indeed, by subsequent examination only that I became assured of the nature of the malady, for I found the morbid parts to consist of sloughy substance intermixed with purulent matter.

*Treatment of Furuncle, Carbuncle, and Anthrax.*

§ 5. The local treatment of these diseases must be directed with a view to soothe the disturbed actions by the application of the linseed poultice, and, in the event of their continuing to extend, and nature seeming by her own efforts unable to bring them to a crisis, to make an opening adequate to remove the tension of the affected parts, and to afford a free outlet to sloughs and discharge.

In the boil we are seldom obliged to resort to such means, for the disease is active in its nature, and in general speedily comes to a termination.

In the carbuncle it requires some resolution to divide the thick and brawny skin through its whole extent; but this is generally a necessary step; and when it is borne in mind that the common integument is the only part which is to be divided, no hesitation should be felt in doing it completely. The incision should be made with a two-edged knife, and should penetrate just so deep as will enable us to feel the subjacent cellular substance. In extensive carbuncle it may be necessary to make two longitudinal cuts or a crucial incision, in order to produce a proper relaxation of the diseased parts and exposure of the subjacent structures. I have never seen the disease extend after this operation was effectually performed, except in cases where the health was irremediably bad; and then the patient seemed to fall a victim rather to the constitutional affection than to the carbuncle.

I have no doubt that a plan of treatment similar to that now recommended should be instituted in cases of anthrax. A free division of the diseased parts should be made. There is so much difficulty, however, in ascertaining the true nature of the disease, and cases of it occur so unfrequently, that I have had no opportunity of seeing this measure put in practice.

§ 6. It has been remarked generally, that there is a peculiarity in the state of the health of those who are the subjects of these diseases. They do not seem dependent on any want of power in the system; the furuncle occurs most commonly in the youthful; and Mr. Hunter says he has known persons with

broken limbs have carbuncle, notwithstanding which the fracture united in the usual period of time. I have no doubt that it is a disordered state of the digestive organs which produces that affection of the general system which causes these peculiar local maladies. I have seen many patients who had been long tormented by a succession of large and troublesome boils escape from a recurrence of them by adopting measures calculated to induce a tranquil and healthy state of the chylopoietic viscera. Though carbuncle generally occurs in persons who live luxuriously, yet I have known the disease happen among the poor, among the temperate, and indeed under a great variety of circumstances. The cases, however, have all had this in common—that the patients were labouring, and had long laboured, under a disordered condition of their digestive organs. I have elsewhere\* detailed a case of carbuncle in which the disease spread after it had been divided; and for the sake of farther illustrating the subject, I will here relate another:—A gentleman of a spare habit of body, who had never indulged in inordinate eating, but who had drank to excess, was attacked with carbuncle in the integuments covering the lower part of the scapula. When I first saw him, the disease was between three and four inches in diameter, and attended with great constitutional disturbance. As it increased daily, I divided it freely, and applied a linseed poultice. By this proceeding, the complaint was greatly mitigated; but it did still slightly and slowly extend. The patient's bowels being obstinately confined, the ordinary doses of cathartic medicines (their qualities being several times varied, and clysters employed in co-operation) were administered every four hours for three days before any evacuations could be procured. When at length the bowels began to act, their discharges were equally surprising in quantity and offensive in quality. The patient went on for two days longer not apparently getting worse, when he suddenly sprang out of bed, and placed himself in a sitting posture on its edge. His attendants came to his assistance, but he was found bereft of consciousness; and on being replaced in bed, he lay without speaking or giving any distinct signs of intelligence for about twelve hours, when he died.

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\* Vide Surg. Obs. vol i. p. 181.



## CHAP. X.

*Of Mortification.*

§ 1. THE phenomena of gangrene and sphacelus as consequences of excess of inflammatory actions have already, to a certain degree, been described. (Chap. iv. § 12.)

§ 2. Parts may perish without undergoing the processes mentioned. Circulation and the other vital functions sometimes cease, and parts become cold and insensible, still, however, retaining their natural structure, so as to admit of being dissected. Some writers have entitled this form of mortification *pale gangrene*; but it seems to me advantageous to restrict the terms *gangrene* and *sphacelus* to the designation of the changes already described as the last effects of disturbed vital actions, and to consider this peculiar form of mortification as a case of simple partial death. Mr. Hunter relates an instance of a man whose leg died in the particular manner now under consideration, after the ligature of the femoral artery. I have myself seen the same thing happen to the hand and fore-arm, without any antecedent injury, or other evident cause for the event. In both of these cases a circle of parts between the perfectly dead and the living structures became gangrenous and sphacelated. In the case which I myself observed, the separation of the living from the dead parts proceeded in the usual way, and the patient did well.

This species of mortification seems to depend on a want of circulation in a part; for it has usually happened in cases where the principal artery of a limb has been tied, or has been found obstructed by a coagulum formed sometimes in consequence of an accident, but sometimes without any assignable cause. The same kind of mortification, however, takes place in small portions of the skin, which are subsequently thrown off like ordinary sloughs; and this disease has even occurred as an endemic, induced apparently by the use of unwholesome food, such as injured and corrupted grain,\* &c.

Mr. Hunter has said, that mortification is the effect of an enfeebled state of the vital powers of parts,—a proposition which, from its self-evidence, might, in the opinion of some, have been spared. Nevertheless, it seems calculated to throw light on the subject, and to make us perceive by what extreme variety of causes the phenomena of mortification may be in-

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\* Vide Dr. C. Woolaston's account of the disease in the Phil. Trans. for 1762.

fluenced; for, as sloughing seems to be the effect of the expiring vital actions of parts, we may understand why the disease should be more rapid in one case than in another, and why there should be a diversity of appearance in the parts that have perished. In some cases of mortification the parts are dry, and in others they are loaded with fluids,—a circumstance which has induced some to attribute the *gangræna sicca* to a paucity of circulation through the arteries, and the *gangræna humida* to an obstruction in the course of the veins. These opinions seem to be confirmed by the fact which has already been stated, of coagula having been found in the main vessels of those limbs which had perished suddenly. I have, myself, in some instances of *gangræna humida*, observed the veins to be greatly diseased, and their canals nearly obliterated.

§ 3. The essential cause of mortification consisting in a diminution of the vital powers, it occasionally proceeds simply from this cause. I have seen cases of persons weakened by fever and want of sufficient nourishment, the extremities of whose toes, fingers, and nose, and rims of whose ears have simultaneously sphacelated. I have also seen some instances of mortification in the toes, that seemed to be the effect of simple weakness, rather than of any material organic disease of the arteries. In these cases, the sloughs formed with very little pain, and were detached with extreme slowness. The patients have survived this form of disease many years.

§ 4. In general, however, when mortification takes place in the toes and feet of old persons, the arteries are so much ossified and altered in structure, that the disease is progressive and destructive from imperfection in the circulation. In these cases the mortification is sometimes preceded by severe pain, and by different degrees of inflammation. The disease sometimes extends by fits, also occasionally remaining stationary, and for a time encouraging a hope that it is about to terminate, and then suddenly spreading farther.

§ 5. In some weakened and disturbed states of health, a slight degree of pressure, continued for no great length of time, by impeding circulation and benumbing the nerves of a part, will occasion mortification. This sometimes takes place without any notable inflammation; but in other cases a certain degree of inflammatory action precedes the process of sloughing.

§ 6. Cold, when violent or long continued, by diminishing vital power, causes mortification. Parts may, however, be greatly affected by cold without perishing, provided proper means be employed for their recovery. Exposure to minor degrees of cold is often succeeded by a peculiar form of inflammation denominated chilblain.

§ 7. There are cases of mortification which result from the disturbed functions of the nerves, whilst the actions of the sanguiferous system are performed in a healthy and vigorous manner. In these cases, the mortification extends by paroxysms in the circumference, whilst the sloughs first formed are detached, and leave beneath them very healthy sores, which heal rapidly. I have endeavoured to excite the public attention to these cases in the First Part of my Surgical Observations.\*

§ 8. Various inflammatory processes, as has been stated, (chap. iv. § 12.) by exhausting the vital powers, end in mortification. Under this head there is one description of case which deserves to be particularly noted. In unhealthy persons, of very different ages, but who had, for the most part, suffered previously from fever, I have seen an inflammation, possessing the erysipelatous character, and attended with effusion into the cellular membrane beneath the skin, occur above the ankle, and produce a slough; from thence it spread rapidly to the inside of the calf of the leg, where it caused more sloughing, and thus progressively up the thigh, till it destroyed the patient. In these cases the absorbents seemed to be affected, and the glands of the groin were in some degree swollen. In irritative inflammation, also, which is productive of sloughing, I am apt to impute the propagation of the disease to that highly susceptible class of vessels, the absorbents. In confirmation of this opinion, I recite the following case:—A young man, not more than 25 years of age, of a very susceptible constitution, and having considerable disorder of the functions of his alimentary organs, had the integuments covering the os calcis excoriated, in consequence of wearing a tight boot, and travelling in a mail coach without the power of removing the annoyance. A fretful sore occurred in the seat of the excoriation, irritative inflammation was set up around it, and spread in patches to the ankle, inside of the calf of the leg, and of the thigh; it extended also to the back of the leg, and to the ham. A succession of large sloughs formed in these different situations, and the patient sunk and died.

#### *Treatment of Mortification.*

§ 9. As the causes of mortification are different, so must the treatment vary. It seems, however, to be received as a very general opinion, that we should stimulate parts contiguous to sloughs, with a view, as it is said, to prevent them from perishing, and to promote the actions by which they recede from, and



cast off, those that have sloughed. Hence hot fomentations, camphorated spirits, and terebinthinate applications are very generally resorted to. The correctness of this opinion, however, may very reasonably be questioned. If weak parts be excited to undue action, they will perish ; if, for instance, frost-bitten parts are subjected to the stimulus even of an ordinary temperature, before the vital powers have in some considerable degree regained their natural tone, they will mortify ; and when parts have perished from excess of action, it must evidently be wrong to stimulate those immediately surrounding them which still possess vitality. I have also had repeated occasion to observe, in cases where stimulating poultices had been applied with a view to accelerate the processes by which sloughs are separated, that an extension of the mortification was the consequence. Under these circumstances, patients are obliged to recur to soothing measures, and to await the slow proceedings of the natural actions.

The fluids used to cleanse the parts around sloughs should, therefore, be used of a comfortable warmth, but not hot. Water acidulated with acetic acid may be advantageously employed for the purpose of correcting the fetor which the presence of the sloughs occasions ; solutions of the chlorurets of lime and of soda are now also employed with the same view.

The division of sloughs is a measure of great utility. By this an outlet is given to putrid fluids, and the penetration of liquids that correct fetor is allowed. It is farther serviceable by producing relaxation of the surrounding living skin, and allowing a drainage from the subjacent cellular tissue, which also relieves tension. Moreover, it permits free secretion and discharge to take place from the subcutaneous vessels, by which inflammatory action is greatly relieved. In the cases spoken of above, § 8., I am convinced I have seen many lives saved by an early and free adoption of this practice.

All dressings to parts in a state of mortification should be frequently renewed.

Transitions of temperature should be avoided ; and where the heat is liable to fall below the proper standard, as happens when the lower extremities are affected, in consequence of languid circulation and deficient nervous power, the parts should be kept well covered and in bed, an equable warmth being evidently beneficial.

The horizontal position is also useful, as it facilitates the return of the blood from the parts affected.

As we have seen that mortification is in many cases brought on by a disturbed and enfeebled state of the vital powers, and as sloughing, when it takes place to a certain extent, produces

much feebleness, and great disturbance of the health, it is a principal object of treatment to tranquillize, and to augment the powers of the system in general. Cordials are beneficial; a moderate allowance of wine should be granted; opium, in doses adequate to soothe nervous inquietude; and camphor mixture with aromatic confection and ammonia, seem in general to be the medicines most useful in mortification.

§ 10. It is the general opinion of old surgeons, founded without doubt on experience, that amputation should not be performed in cases of mortified limbs till the sloughing has ceased to extend, and the patient's health has recovered a degree of tranquillity adequate to enable it to sustain the shock of the operation, and repair the injury thus inflicted. In reason we cannot but approve of this inference, which, nevertheless, is not without its exceptions; for in mortifications caused by injuries received whilst the patient's general health is unimpaired, the principle may be successfully deviated from. Still, however, cordials and opium to soothe the vital actions, in conjunction with all other means likely to induce tranquillity, are in general required after an operation performed under such circumstances.

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## CHAP. XI.

### *Œdema.*

§ 1. THIS word is used to designate a swelling in consequence of an effusion into the cellular substance of a fluid, which is sometimes of an aqueous, sometimes of a gelatinous consistence, unaccompanied by heat or evident inflammation. Occasionally, however, we have superficial inflammation, depending apparently, at one time, on the distension of the skin, and at another, evidently induced by the same disturbed state of health which causes the *œdema*. These varieties in the form of the disease have given rise to its distinction in nosological systems into three species,—the *œdema aquosum*, the *œdema simplex solidum*, and the *œdema cum erythematē*.

§ 2. *Œdema* may result from defective absorption; from an impediment to the free return of the venous blood; and likewise from excessive secretion from the arterious system. We have evidence of the disease arising from the first of the causes mentioned in cases of complete cancerous affection of the axillary glands, in which the arm is often so much swollen, and the skin so greatly distended, as to require punctures for its relief.

We have frequent opportunities of observing the effect which impeded venous circulation has in producing œdema. The pressure which the gravid uterus sometimes makes on the iliac veins, causing œdema of the lower extremities, may be cited as an instance.

When the disease takes place, and neither of these causes seems to operate in its production, it must be considered as depending on inordinate secretion from the arteries. Sometimes a kind of chronic inflammation appears to pervade the whole of an œdematous limb, and then the disease is general; sometimes again the swelling is merely subcutaneous. In cases of ill health attended with œdema, and terminating fatally, the effusion often disappears a short time before death—circulation and secretion decline in energy, whilst absorption goes on; which shows that the disease, under such circumstances, is the effect of excess of secretion. When fractured limbs are moved at too early a period, and before the bones are perfectly consolidated, irritation is caused in the uniting medium, and a general œdema of the limb frequently ensues. This must be imputed to increased secretion; for the swelling subsides if the injured part be kept at rest.

Persons in ill health are liable to œdema, which disappears as their health improves. A youth had subcutaneous œdema, which extended over the whole body, and made the skin everywhere feel firm and thick. This state had continued for a long time, and greatly perplexed his medical attendants. The boy's digestive organs were very much disordered; but as they became healthy, which by proper attention happened in no great space of time, the œdema disappeared.

Œdema, it has been said, is not commonly attended by any increase of temperature; on the contrary, it is frequently observed that parts affected with the disease are apt to have their natural heat considerably diminished.

§ 3. I have seen a case of metastasis of œdema.—There was a middle-aged woman in St. Bartholomew's Hospital who suddenly had an œdematous swelling of one half of her face. The swelling was considerable, without heat or redness. On the third day after its appearance, the hand and fore-arm, as high as the elbow, became œdematous, and the effusion in the face disappeared. Shortly afterwards she became very unwell, when the œdema of the arm gradually subsided, and within two days she died, apparently from oppressed respiration. The body was examined, but no important morbid appearances presented themselves. The lungs did not collapse, and there was some serum and mucus in the air-vessels, but otherwise they were not unhealthy.



*Treatment of Œdema.*

§ 4. The topical remedies usually employed in œdema are gentle frictions, and moderate and equable pressure by bandages. (For the effects of these remedies, see chap. v. § 4.) Where there is erythema, the bread-and-water poultice is generally found a useful application. When the disease proceeds from an obstruction to the venous circulation, or to the functions of the absorbing vessels, it will be proper to direct our means to the alleviation of the cause. When œdema succeeds to fractures, attention to the proper position and motionless state of the injured parts is indispensable. As œdema is often occasioned and kept up by constitutional causes, so are we, in our treatment of the disease existing under such circumstances, required to tranquillize, and endeavour to improve the state of the general health.

## CHAP. XII.

*Of Interstitial, Progressive, and Ulcerative Absorption.*

HAVING spoken of those diseases which seem chiefly to arise from faulty actions of the sanguiferous system of parts, I proceed, in the next place, to treat of those which owe their principal characters to predominant absorption. Mr. Hunter distinguished excessive absorption into three kinds,—the interstitial, the progressive, and the ulcerative. In these, as in the general and local affections already treated of, the whole of the functions of the part implicated are to be considered as disturbed. The morbid condition of the absorbing system is only the feature that forces itself more particularly on our notice, and is therefore taken as characteristic of the disease.

§ 1. Parts may waste by *interstitial absorption*, and at a future period regain their original bulk, no essential structure having been removed. We have already seen chronic inflammation producing interstitial deposition and enlargement of parts, in the treatment of which our object was to procure the re-absorption of the matters so deposited.

§ 2. The absorbents may, by their increased actions, remove the entire substance of parts, so as to create spaces where naturally there were none. In aneurisms of the arch of the aorta, the ribs and all the parts which cover the disease are progressively removed. In aneurisms of the abdominal aorta, I have known palsy of the lower extremities, occasioned by pressure

upon the spinal chord, in consequence of the removal of the bodies of several vertebræ, give the first intimation of the existence of this fatal malady. In these cases neither inflammation nor secretion takes place in nor around the parts that are progressively removed. The progressive absorption of parts makes a path for foreign bodies accidentally swallowed or intruded beneath the skin. We frequently see pins and needles come out at places very remote from those where they first entered. These bodies, as well as bullets and splinters of bone, often proceed in a direction very different from that which might have been expected; they even advance against gravity, apparently in consequence of a track being prepared for them by the absorbents. Foreign bodies sometimes travel to great distances in this way, without exciting attention, although on other occasions great nervous irritation accompanies their transit; generally, however, it is only when they approach the surface that inflammation and ulceration are excited.

I once met with a curious instance of the absorption of the subcutaneous fat and cellular substance, without any apparent excitement of the sanguiferous or nervous systems of the affected parts. A man, about 35 years of age, had three perpendicular furrows formed in the front of his belly, on the right side: two of them extended from just above Poupart's ligament as high as the umbilicus, and one reached about half as far. They were of considerable depth, and so wide as to admit the end of the finger. The skin which felt thin appeared to adhere firmly to the aponeurosis of the external oblique muscle. No sensation in the parts had apprized the man of what was going on: he discovered the peculiarity entirely by accident, and was considerably alarmed, conceiving it might be the precursor of rupture. No alteration occurred in the state of the parts, so long as I had an opportunity of observing the case.

### *Of Ulceration.*

§ 3. When parts of the body are removed by the excessive action of the absorbents, and inflammation, secretion and pain accompany the process, the disease called ulceration is induced. Ulceration may therefore be defined to be a chasm with secretion from the exposed surface. Mr. Hunter held the opinion, that ulceration was a process instituted in disease to prevent the occurrence of a more serious malady, viz. the threatened death of the part. Irritative inflammation, which so evidently tends to induce mortification, is often the cause of very rapid ulceration; indeed, many sores form, and abscesses occasionally open, partly by an ulcerative process, and partly by sloughing; circumstances which show that the diseased parts are disposed to perish,

and make it appear likely that they would slough were they not removed by absorption. Parts sometimes ulcerate also without much inflammatory action, in which case they are probably weak or disposed to perish. Ulceration, moreover, frequently supervenes upon inflammations of a chronic character; and in debilitated persons we observe the ulcerative process occur in parts which long continued pressure, by impeding circulation and the nervous functions, has rendered disposed to perish; indeed, whether they ulcerate or mortify is often seen to depend on the degree in which the bed-ridden patient is weakened; for if he be very much debilitated they will slough, if he be not so much reduced they will ulcerate. Long continued pressure, however, by producing inflammation, and exhausting the living powers, will cause ulceration even of healthy parts, as we see happen when the edge of a splint has been left ill guarded, and allowed to press upon some exposed part of a broken limb. Upon the accidental occurrence of weakness and constitutional disturbance, the granulations which had filled the chasm of an ulcer are very apt rapidly to disappear. Newly formed parts, indeed, having less vital energy than original structures, are very liable to be removed by absorption. Mr. Hunter, in support of his opinion on this subject, has referred to a fact recorded by the chaplain of the Centurion in his account of Lord Anson's Voyage round the World. We are told, that the crews of the ships, having been much reduced by excessive toil and want of fresh provisions, as they were doubling the southern point of America, became affected with scurvy, and that in those individuals who had formerly had ulcers the sores broke out again; and even those who had suffered from fractured limbs had the conjoining callus absorbed, so that the bones became disunited. It is therefore reasonable to suppose, that ulceration, like mortification, may arise from simple weakness, or from excessive action producing weakness.

So far ulceration has been treated of as a process of simple destruction. In this unmixed form, however, the disease is very rarely seen, and the term is commonly employed to designate a compound operation,—one of destruction, and another of reparation; indeed it is used even when the reparative predominate over the destructive processes, for though a sore be cicatrising, it is still called an ulcer. I have, however, seen the unmixed ulcerative absorption in two cases. In one it occurred in the soft palate, which gradually wasted away till it was entirely removed, as also a considerable portion of each tonsil, the surface of the sore looking clean and not very unhealthy, but without any apparent discharge or attempt at reparation. The destructive ulcerative process then ceased, and the sore cicatrized. In the



other, the ulcer began near the inner angle of the eyelid, and destroyed progressively the eyelids, and the whole contents of the orbit, except the eye-ball with its vessels and nerves. The globe retained its natural form; the front was dry, horny, and of a brown colour. In this case, so long as I had an opportunity of observing it, no attempt at reparation was ever made; as in the former, also, there was scarcely any discharge, and the exposed surface had not a very unhealthy aspect; the ulcerative process, however, was here accompanied with extreme pain. It had continued for several years.

§ 4. In common ulceration, upon a cessation of the predominant action of the absorbents, attempts at reparation ensue. Small depositions of glutinous substance are made from the arteries over the surface of the sore, into which blood-vessels, absorbents, and nerves shoot, and a new growth is thus produced. This new growth, which occurs principally from the bottom of the sore, has a granulated appearance, and from its surface new granulations are successively formed, till the hollow of the sore is filled up to a level with the surrounding skin. That the process of reparation takes place in the manner described, is rendered evident by minutely injecting an ulcer in the dead body, and making a vertical section of it, when we perceive that the vessels have shot perpendicularly upwards from the bottom till they nearly reach the summit of the granulations. Thus do newly formed vessels, themselves naturally weak, produce deposition and new growth. The weakness of the vessels of granulations is manifested by the sudden change which is occasioned by an alteration in the position of parts affected with ulcers. Thus, if a person who has an ulcer on his leg rise from the horizontal position, and set his foot to the ground, the granulations, which had previously been florid, become dark and purple; owing to the weakness of the vessels, and consequent tardiness with which the circulation is carried on.

Healthy granulations are small, conical, and of a florid colour. Pus is secreted from their surface, and has the distinguishing qualities already described when the actions are healthy. (Chap. iv. § 10.) The state of the discharge, indeed, often enables us to appreciate the nature of the actions which are going on in sores; in sinuous ulcers, where we cannot see the surface, we judge of the condition of the sore by the quality of the discharge.

When the hollow of an ulcer is filled up by granulations, a thin skin to cover them is produced from that which surrounds the margin of the sore. The vessels which organize this new production shoot horizontally from those of the sound skin, as may be demonstrated by minute anatomical injections. Ulcers rarely form skin on their surface, though they do so occa-

sionally. It is on account of the rarity of this occurrence, that if the edges of a sore are diseased, and consequently incapable of producing a new growth of skin, or if they are in any way prevented from accomplishing this process, the granulations continue to secrete pus, and remain unhealed for a very great length of time. The new skin which grows over ulcers, though thin, is covered with cuticle, a circumstance which identifies its nature. Mr. Hunter doubted whether it had a rete mucosum or not; but he at length found this part in the cicatrices of Africans.

After the ulcer has healed in the manner described, a considerable change takes place in the newly-formed substances by which it is filled up. The vessels diminish in size, and the part becomes hard and pale, and much reduced in bulk, so that the surrounding skin, forming the margin of the sore, is forcibly drawn together. The skin, in the circumference of a circular sore is thus thrown into folds, or puckered; and the sides of a longitudinal one are so closely approximated, that the original skin is dragged from its natural seat, and deformity occasioned, for which blame is often imputed to the surgeon. When the skin on the front of the neck has been destroyed by a burn, the integuments beneath the lower jaw become approximated to those of the chest; and then the mouth, the alæ of the nose, and even the under eyelids, are dragged down in a hideous manner. Little good is found to result from simply dividing the indurated cicatrices in these cases, for the chasm so made is again filled up with new flesh, which subsequently undergoing the same processes that took place in the first cicatrice, the deformity is reproduced nearly in the same degree as before. Mr. Earle has of late contrived to relieve some of the evils consequent on the contraction of cicatrices in the extremities. In cases where there had been a loss of skin in the front of the elbow-joint, and a transverse cicatrice had formed, which prevented the extension of the fore-arm, and even impeded the motion of the hand, Mr. Earle has taken away the whole of the cicatrice by an elliptical incision, the long axis being in the direction of the arm, which then admitted of being extended and bound upon a convenient splint, during the progress of the cure. The wound made by this operation fills up in the usual way with granulations, which also subsequently contract, but a longitudinal instead of a transverse cicatrice is produced, so that the power of extending and using the fore-arm is recovered. The results of this practice are particularly valuable, as showing how the injurious effects from the contraction of cicatrices may be obviated. If we resolutely keep parts in their proper position, till the shrinking of the newly-formed substance has

been accomplished to its utmost extent, we may have the process finished without that contraction of the skin ensuing, which would produce deformity, or impede the natural motions. Mr. James, of Exeter, has several times divided the indurated cicatrice succeeding to burns on the throat, by which the integuments immediately beneath the jaw were united to those just above the collar-bones, and then, by turning in the upper portion of the skin, so as to cover the basis of the lower jaw, and obtain a surface for support, he resolutely kept the head in its natural position, by means of an inflexible collar, until the utmost shrinking of the granulations, by which this wound was filled up, had been accomplished, and thus succeeded in removing the deformity. I had myself formerly been perplexed in the treatment of those cases, in which the fingers and toes are united from birth, by a thin web of skin. The following instance will serve as an example of this kind of case:—A child, all of whose fingers except one were united by a process of skin as far as the nails, when about four years of age had these webs divided as low, or even lower, than the part where the fingers usually separate. The wounds healed, but the webs grew up as before. I then divided them as in the first instance, and kept the bottom of the wounds, between the fingers, in a state of ulceration by irritating dressings, and the application of a cord-like bandage between the different fingers, secured to a circular one about the wrist, till the sores on the sides of the fingers had healed, and the cicatrices had contracted to the utmost. When this seemed to be accomplished, the little sores at the roots of the fingers were suffered to heal, and the webs did not grow again. I conclude it is by a similar process of contraction in the cicatrice, that wounds of the tongue heal and become effaced, to a degree which could scarcely have been anticipated.—A person bit his tongue by accident, across nearly three fourths of its breadth, at the distance of about an inch from its tip. He was admonished to keep the tongue as still as possible, and to take nourishment only from the spout of a tea-pot, conveyed far back into the mouth. The division in the tongue was very conspicuous for a long time, but it gradually became less and less apparent, till at length only a slight furrow on the edge remained.

### *Treatment of Ulceration.*

§ 5. When an ulcer is first formed in consequence of inflammatory disease, the chasm is of different depths, and its margin is irregular. This is in consequence of the absorption causing the ulcer having taken place to a greater extent in some parts than in others. The inflammation which preceded and accom-



panied the disease still surrounds the ulcer; there are no granulations—all appears waste; and any renewal of inflammatory action would cause an enlargement of the chasm. The circumference and surface of the sore are generally very sensitive, and the discharge is watery or viscid. Under such circumstances the object of surgery is to appease irritation by local and constitutional treatment. The part affected should be kept in a position that favours the return of the blood from its vessels. I know of no local application more likely in general to appease morbid irritability than the aqueous solution of opium, which, however, should not be used of great strength, lest it irritate by its acrid quality. When there is a tendency to slough, or the discharge is fetid, the addition of a very small quantity of nitric acid to the opiate solution is useful. Soft and smoothly folded lint, wetted in the solution, made tepid, should be applied to the surface of the sore, and covered by a dressing of folded linen spread with mild salve, to prevent evaporation and the drying of the lint to the sore; the bread and water poultice may be laid over all, to soothe and to regulate the temperature of the inflamed and irritable parts around. Suitable bandages should be lightly applied to keep the dressings in their places, and prevent the mechanical irritation which their motion might occasion.

Under this treatment the progress of ulceration will be likely to cease, the surrounding inflammation to subside, and reparatory actions to commence. When the parts have been exhausted by vehement action, some interval of time should be allowed them for the recovery of their powers and tranquillity, before other measures than those now recommended should be adopted. If, after these have been used some time, the diseased parts remain morbidly susceptible, or if the reparative actions advance sluggishly, we may then very advantageously have recourse to applications that stimulate slightly. The stimulants usually applied to ulcerated surfaces are weak solutions of various metallic salts, as of sulphate of zinc, sulphate of copper, nitrate of silver. The effect of such remedies in diminishing morbid susceptibility is particularly evident in cases of ophthalmia. After having soothed and quieted an inflamed eye, we wash the surface with a weak solution of sulphate of zinc. This, though so weak as scarcely to be perceptible to the taste, still gives considerable pain when applied to the eye; but when the uneasiness thus excited has completely subsided, which it does speedily, the inflamed surface feels much less irritable than before. Less and less pain is experienced from each subsequent application of the wash, until it seems to lose its stimulating effect entirely: we therefore increase its strength by degrees, in

proportion as the excitability of the inflamed surface diminishes. By treating an ulcer on the same principles we may render it insusceptible in an inordinate degree, and convert it from a very irritable sore into one that shall be indolent.

In conducting the process of allaying inordinate susceptibility by the use of stimuli, we should, however, always proceed with caution; for by using these applications too frequently, or of more than proper strength, we may excite a kind of reaction, and again render the disease irritable.

§ 6. Ulcers have been divided by Sir Everard Home into those which are simply weak, those which are irritable, those which owe their character to some peculiar morbid propensity in their actions, and those which are apparently connected with a diseased state of the veins.

§ 7. Weakness being the essential characteristic of ulceration in all its stages, it is not surprising that we should observe, in the process of the incarnation of sores, circumstances indicative of simple debility; the granulations grow very slowly, and do not project from the surface: they are pale, and the surrounding skin is flaccid; the discharge is also more of a serous than of a purulent nature. Sir E. Home observes, that these sores are most amended by tonic remedies; and if there happen to be two sores on a limb, that the one nearest the trunk of the body soonest assumes a healthy character and gets well.

The description which Sir E. Home gives of an irritable sore corresponds with the appearances just recited as attending the conclusion of the ulcerative process. Ulcers, however, having a great variety of appearance, may become morbidly irritable. In the treatment of ulcers in this state, the objects are the same as those which have been indicated when speaking of the means of arresting the progress of ulceration, and of correcting morbid irritability in general.

§ 8. In the indolent ulcer, the granulations are large, flat, and of a tawny or purplish colour; the secretions, from its surface, more serous than purulent; the skin at the edges of the sore is thickened, and its cuticle is white. The surface is very insusceptible of stimuli, and is improved by their application. Nevertheless, these indolent sores, which are so frequently met with on the legs of the poorer classes of society, may, from general indisposition, or improper local excitement, be converted into irritable ulcers, and become in consequence enlarged. We see enough in bodily disease to warrant the opinion that weakness, when unexcited, is likely to degenerate into indolence, and when provoked, to manifest irritability.

§ 9. Weak parts, when excited, are apt to assume peculiar states of morbid action; and it is almost impossible to describe

the various appearances and progress of ulcers thus affected. Their secretions are watery or ichorous, viscid or sanious, concrete and adherent to their surface, and then termed *sordes*. The discharges are often impregnated with sulphureted hydrogen gas and ammonia, and are sometimes so acrid as to excoriate the surrounding parts; in which case it is necessary to cleanse, dry, and anoint the skin round the margin of the sore, for its protection.

The peculiarities now alluded to seem to me to be chiefly caused and kept up by a disturbed state of the general health, and are most likely to be removed by means which tranquillize and improve it.

§ 10. Sometimes one diseased action will supervene upon another, producing an ulcer of a character very different from that which it had previously possessed. This is often seen in buboes, when an ulcer, weakened and exhausted by excess of action, assumes a new and peculiar morbid condition. Formerly, when the health used to be disturbed by the too free use of mercury, this was a frequent occurrence. A gentleman had a chancre on the prepuce, which was treated as syphilitic. After some weeks a bubo appeared in the groin, in consequence of which the quantity of mercury was increased, by rubbing in the ointment on the affected side till his mouth became sore, and the system was presumed to be adequately affected. The bubo went on, nevertheless, to suppuration, opened, and fretted into a foul ulcer, which, after some time, became stationary. The mercury had been discontinued; but as the sore did not improve, the patient became dissatisfied, and I being then young in the profession, other surgeons were consulted, who recommended the renewal of the mercurial course. When the patient's mouth became affected a second time, the sore began to extend superficially, but spread much more widely by burrowing in the cellular substance. Another consultation was held upon the case, when it was agreed that the mercury should be suspended, and that the patient should go into the country; a great variety of local applications were also suggested. After a time, the process of ulceration became stationary, but no reparative action ensued. A third consultation was held, when it was resolved that the patient should be sent to the sea-side. There he remained for several months; but he again returned to town, without any alteration in the state of the sore. A fortnight after his return to London, the ulcerated surface began to cicatrize, which it did completely in a very short space of time, and without producing any granulations. This case occurred shortly after I began the practice of my profession, and made a great impression on my mind, as being an instance of



morbid propensities occurring in an ulcer, in consequence of weakness, induced by prior excess of action, in conjunction with a reduced state of health; also as an example of the sudden cessation of such local morbid propensities.

§ 11. In some ulcers, occurring in unhealthy persons, the morbid actions are of such a nature that they never cease, but spread around in every direction. I have seen such ulcers begin in the skin, and communicate similar morbid actions to all the parts beneath them, so that at length even the bones became involved in the disease. In other cases, the subjacent parts do not seem to assume the morbid actions of the ulcer, but the disease spreads in its circumference, as we see in some of those ulcers that occur about the alæ of the nose, and in the neighbourhood of the under eyelids. In other cases, the diseased actions gradually cease where they first occur, but the surrounding parts assuming the same kind of action, the disease becomes herpetic in its circumference. This form of disease frequently takes place about the alæ of the nose.

§ 12. In some sores of the kind last described, the margin becomes thickened and inflamed, and then ulcerates or sloughs, which causes the disease to extend in paroxysms. When sores spread in this manner, apparently from the establishment and occasional recurrence of morbid actions in the skin forming their margin, it is often useful to destroy the surface of the edge that is in contact with the sore, by the application of nitrate of silver, repeating the application at the interval of two or three days, or as soon as the sloughs thus formed are thrown off. By this means we prevent the surface nearest the sore from being morbidly sensitive, or communicating specific irritation to the parts next in succession. We also keep the edges employed in seceding from and detaching the part which has been destroyed by the caustic. The same treatment is applicable to sores having a highly sensitive state of surface; this being destroyed, they are no longer exquisitely painful, and the disease has a new action given to it, that of detaching the successive films of slough we produce.

In all herpetic sores, it is of consequence to correct the state of the general health; for, unless this were disturbed, the sound skin would not assume those morbid actions which are communicated to it by continuous sympathy.

§ 13. When healthy ulcers become affected with that form of disease called hospital gangrene, they begin to slough from a small district in their surface, whence the mortification spreads over the whole sore, and even extends to the surrounding parts. The portion of the ulcer first affected becomes of a tawny colour, and is extremely painful before it perishes. The pheno-

mena of this disease, and all collateral evidence, warrant us in believing that it is produced by some morbid poison being applied to the spot where the sloughing commences. This opinion is confirmed by observations on the sloughing phagedæna of the nates of females ; for it begins in some point denuded of its cuticle, and exposed to the contact of discharges descending from the genitals.\*

The sloughing of sores appears sometimes to depend upon a specific irritation, affecting their surface. In this case, stimulants, by exciting new and more healthy actions, put a stop to the mortification. Such, it is probable, is the nature of those sloughing sores which are benefited by balsamic and terebinthinate applications. I have often seen sloughing put a stop to, and a healthy aspect given to an ulcer, by the application of the balsam of Peru. The qualities of the discharge seem to have a material influence on the surface, exciting and maintaining those actions which end in mortification. Many sloughing sores are benefited by having their surface kept constantly wet with a very dilute acid. This corrects fetor, and destroys the acrimony of the discharge.

§ 14. Some ulcers spread chiefly in the cellular substance, leaving the margin and superincumbent skin entire. These form burrowing or sinuous ulcers ; and the mode of their extension shows that parts naturally weak, or possessed of the lowest degree of vital power, are most prone to assume the diseased actions. Many diseases which begin in the form of abscesses, continue to exist as sinuous ulcers.

§ 15. Some ulcers produce exuberant growths, or fungi, which, if destroyed, are quickly regenerated. Sometimes the fungus, having attained a certain size, sloughs, but is soon reproduced. Sores of this description are, in general, of an intractably morbid character. The actions of the base of the fungus must be changed, or its growth and reproduction will continue.

§ 16. Some ulcers bleed ; and even from sores in which there appeared no morbid actions, hemorrhage has sometimes been observed to occur periodically in females whose menstrual discharge was suspended. Hemorrhage from ulcers seems to depend either on a lax and unenergetic state of the vessels, on a deficiency of the coagulating principle of the blood, or on a peculiar irritation of an inflammatory kind. In the first two cases, astringent and tonic applications, and such as promote coagulation, are indicated, and found beneficial. The hemorrhage from

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\* See what is said on this subject in Surg. Obs. vol. i. p. 220.

ulcers seems also, in some cases, to be owing to inflammatory actions of the vessels, which appear often to be of a specific nature; and then soothing applications, such as poultices, tepid fomentations, and other measures, which might at first sight seem calculated to encourage hemorrhage, are useful. Mr. Hunter had seen so many instances of this kind, that he was induced to recommend a plan of treatment of the above description in a case of hemorrhage from the stomach, and with complete success:—A lady who had been subject to repeated and alarming hemorrhages from the stomach, and which no treatment had alleviated, consulted him. He inquired if she had no sensations forewarning her of the approach of the bleeding, and on being informed that she had, he advised her at the time she felt the attack coming on to drink a tumbler full of tepid water. This seemed to tranquillize irritation, for no hemorrhage afterwards took place. The hemorrhage from ulcers that seems dependent on a specific kind of irritation may likewise be obviated by stimulating applications, which induce new and more healthy actions.

§ 17. Some ulcers of the leg appear to be caused and maintained by a varicose state of the superficial veins in their vicinity. These sores get well if the limb be kept in a horizontal position, which favours the return of the blood. They are apt to recur, however, on the limb being again used. For the cure of these ulcers, it has been proposed to divide, so as to procure the obliteration of the venous trunks principally affected with varix. It has also been proposed to treat in a similar manner the irritable veins in the circumference of the ulcer. But as operations on veins are found to be attended with extreme danger, and as these vessels in the neighbourhood of ulcers often appear to be peculiarly irritable, this mode of treatment has been very much laid aside: and as the sticking-plaster bandage, by giving uniform and adequate support to the enlarged vessels, seems of itself competent to prevent their injurious distension, and to accomplish the cure of the ulcers which attend this state, it seems unnecessary to have recourse to any hazardous mode of treatment.

### *Of Dressings to Ulcers.*

§ 18. There is scarcely an article in the pharmacopœia which has not been employed as a dressing to sores, and on which some comment might not be offered by those who have long practised their profession. But knowledge of this kind must be in a great degree of an empirical nature. Peculiar appearances, which cannot be well explained or understood, seem to require peculiar modes of treatment. It is certain that a fretful



ulcer, which greatly disturbs the system, will, upon the application of a suitable dressing, become tranquil, and the system be in consequence greatly relieved. This subject is, therefore, deserving of study, although the greatest experience does not enable a surgeon to select with certainty a successful application; for every candid surgeon will allow that, after having tried a round of applications without benefit, one has at last been employed from which no great good was anticipated, but which has nevertheless completely allayed the morbid feelings of the sore. It must further be observed, that this successful dressing will after a time lose its effect, and another must be sought for. Formerly I thought it the duty of every surgeon to make this subject a particular study, but having of late years become convinced that the morbid peculiarities of sores in general depend upon constitutional causes, and that they will heal under simple dressings as the health improves, I have not deemed topical applications of such importance. All I shall attempt to inculcate on this subject will, therefore, be confined to the principles which should guide us in our selection and use of dressings.

Having already adverted to the means of quieting and subduing morbid irritability, I may add, that medicines seem in general to have a similar operation on susceptible surfaces as on the stomach. Opium allays pain and irritation; bark and weak solutions of metallic salts seem to give tone to the part to which they are applied, while stronger solutions act as stimulants; spirituous, balsamic, terebinthinate, and pitchy applications, and camphor, seem to have a similar effect upon sores as cordials upon the stomach.

Many of the applications we use to ulcers are designed to correct the qualities of their discharges. We fumigate their surface with carbonic acid gas, or we apply the fermenting poultice, or fresh burnt charcoal; diluted acids, diluted spirits, solutions of the neutral salts, such as of nitre, the chlorurets of soda or of lime; also fresh vegetable juices, &c. These various applications correct the fetor of the discharges, and are further beneficial, inasmuch as many of them have an effect upon the actions of the sore itself. In fumigating sores with cinnabar, which is often done, we apply sulphurous acid gas to them, and at the same time cover their surface with an oxide of quicksilver. We also use starch and chalk in powder to absorb the discharges of sores, or we mix these substances with other articles that have further effects; as flowers of zinc, calamine, oxide of iron, bark, myrrh, and opium.

Some applications, again, appear to excite a peculiar state of action, and thereby counteract the morbid condition we are desirous of removing. Mercury and arsenic seem to have such

effects, the latter in particular : arsenic produces a peculiar and painful affection of the nerves, and inflammatory action of the vessels, which, if excessive, is destructive to the life of the part to which it is applied. Arsenic, therefore, produces deeper sloughs than are in general occasioned by those caustics that decompose the animal textures. As diseased parts are most likely to perish on the application of any extraordinary stimulus, so arsenic has been found to cause the sloughing of cancer and other diseased growths through their apparent extent, and has thus become famous in the hands of empirics, who apply it for this purpose indiscriminately. Thinking it may be useful to relate a case of this kind, I subjoin the following :— A patient came from the country to consult Sir Astley Cooper and myself on account of a cancer in the breast. We had no hope of being able to extirpate the whole of the disease by an operation, for it had extended deeply into the axilla, and we therefore recommended palliative measures. The patient then applied to a quack, who put an arsenical application to the tumour, which caused horrible pain, and was obliged to be removed in 12 hours, as it seemed to threaten her life. For three days no reasonable hope could be entertained that she would survive. The stomach rejected almost every thing she swallowed ; she suffered violent tormina, and her bowels discharged great quantities of mucus mixed with blood. Gradually, however, she became easier, and recovered, though much enfeebled. Apparently, the whole of the disease of the breast sloughed out, leaving a large cavity with ulcerating edges, but of no unhealthy aspect. Yet, as might have been expected, the disposition to disease extended beyond its actual boundaries, so that the circumference soon threw out an unhealthy fungus, and the disease went on, no good consequently resulting from this imminently dangerous experiment.

The cases which best illustrate the corrigent effects of arsenic on the morbid actions of sores, are those of peculiar ulcers, which frequently occur on the toes and sometimes on the fingers. The skin surrounding these ulcers is thickened and of a dusky hue. The surface of the sore is smooth, and of a tawny colour, and discharges a foetid sanies or ichor. These sores in general spread under the nail, which, consequently, is detached, commonly coming away in portions. The sores are so extremely painful through the night, that they prevent sleep ; during the day they do not cause so much suffering. I have known them continue for two years, unaltered by a great variety of applications, and yet readily get well when arsenic was employed. Sir C. Blicke was, long ago, in the habit of using arsenic as a caustic to these sores. according to an empi-

rical formula, called Plunkett's epithema. This composition was spread upon lint, and applied to the ulcerated surface, where it was suffered to remain during three days. A deep slough was the consequence of this application, upon the separation of which the sore healed. The mode of using the remedy, however, was so horribly painful, that I was induced to try whether the application of arsenic, in a milder form, and such as did not give pain, would correct the morbid actions of the sore; and I found it answer my most sanguine expectations. To show this in a very striking manner, I relate the following case:—A gentleman who lived in the neighbourhood of St. Bartholomew's Hospital, had an ulceration of the kind just described, attacking several of his toes. When I first saw him, I dressed the sores with arsenical wash,\* promising to meet his medical attendant on the following day. The patient had been accustomed to summon his servant at five o'clock in the morning to get him some tea or coffee, to recruit him a little from his exhaustion through pain and want of repose. The disease had continued for two month's gradually getting worse, during which time he had scarcely slept; but on the morning after the application of the arsenic, his bell had not rung even at nine o'clock, and his servants knocked repeatedly and loudly at his door without obtaining any answer: the anxiety of his domestics at length induced them to force it open, when they found him in a deep sleep, which had continued without interruption from the time of his lying down in bed.

The form in which I have used arsenic with a view to change the actions of exposed surfaces, is either that of the arsenical wash, in which pieces of lint are wetted and applied, or of an ointment made by mixing equal parts of sublimed sulphur and white oxide of arsenic, these being the chief ingredients of Plunkett's nostrum, with simple salve, in the proportion of 10 or 12 grains of the compound powder above mentioned to half an ounce of the salve. This ointment is spread upon lint and applied. The strength may be increased, but never to such a degree as to cause pain; and, used with this precaution, I have never known it produce any detrimental effect on the general system. Those sores which are so much benefited by its application are usually not large. In using it as a dressing in other cases, I have generally confined its contact to the diseased edges of the ulcer, and always be cautious not to apply it to a larger extent of surface than seemed necessary. One of the most remarkable instances of its success, in conjunction

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\* 2½ gr. of the arseniate of potash dissolved in ℥ijss. of rose water, and ℥ss. of dilute spirit.



with other means, in subverting the diseased actions of a sore, is the following :—A man came into St. Bartholomew's Hospital with an indurated under lip, having a firm, fungated, irregular surface, like a cauliflower. The disease extended from the corners of the mouth in a wedge form to the chin. The experienced surgeons did not think the disease carcinomatous ; but none, I believe, thought that it admitted of cure. As the disease could not be extirpated by an operation, except by the removal of the whole of the under lip, (a measure which would have required a large triangular portion of skin to be raised from beneath the jaw to supply its place,) and as the disease did not seem to make any rapid progress, we did not feel obliged to decide immediately on operating. The patient meantime was directed to take decoction of sarsaparilla, and alterative doses of the pil. hydrarg., whilst his diet and the actions of his bowels were carefully regulated, and the arsenical wash was applied as a dressing to the sore, which in the course of about three months became perfectly well. What rendered the case more remarkable was, that the patient assured us his father had died of a similar disease, which began in the lip, and never ceased to spread till, to use the man's own expression, it ate into his wind-pipe, and destroyed him.

It is of importance to observe, that the absorption of poisonous medicines applied to the surface of ulcers sometimes renders their continued use detrimental, and even dangerous. Ulcerated surfaces seem indeed to have great powers of absorption. If a large sore be dressed with a mercurial preparation, patients are quickly salivated ; and arsenic and other medicines have in this way frequently been known to produce their specific effects on the system. To impress this fact upon the mind, I may mention, that having once dressed a very fretful sore, which no application that had been used seemed in any degree to quiet, with a weak solution of the extract of belladonna, the patient lost his sight in about two hours, and continued during an hour quite blind, when the sight began to return. The sore was very much benefited by this application ; but its effects upon the system deterred me from repeating it.

§ 18. As weakness is the essential characteristic of ulceration in all its stages, a bandage, which may gently support and even compress the vessels in the sore and its vicinity, so as to prevent their over-distension with blood, must contribute to allay their increased actions, and favour their acquirement of strength. The many-tailed bandage of sticking-plaster, as suggested by Mr. Baynton of Bristol, is well adapted to these ends. The steady and equal pressure it makes, allows the limb to be placed in a perpendicular position without any injurious

turgescence of its vessels following, or the healing actions of the sore being impeded. It likewise promotes interstitial absorption; and limbs that have been long swollen soon become reduced to their natural size and appearance, by the daily renewal of the uniform pressure it exerts. I have seen the irritable inflammation which threatened the formation of an ulcer put a stop to by the sticking-plaster bandage; and to me it seems applicable to irritable as well as to indolent sores.\* The application of this bandage does not preclude the employment of any of those delicate attentions to the dressing of ulcers, which their susceptibility or morbid condition may render necessary; for having finished the dressing, and laid over it a compress of folded linen, we apply the bandage of sticking-plaster, and over the whole we put a calico roller. When the skin is irritable, we may previously wrap the whole limb in linen, to guard it from the excitement which the plaster might produce. When the regulation of temperature is a desirable measure, if we make the compress, which is laid over the sore, to extend above and below the sticking-plaster, and then moisten the roller with tepid water, we perfectly accomplish this object; for the compress will become wet, and evaporation will be produced without loosening the sticking-plaster bandage.

§ 19. I am satisfied that the constitutional treatment of ulcers is of great importance; small doses of opium to allay irritability; and mineral acids, as tonics, are beneficial; and as ulceration is connected with weakness, the Peruvian bark is of great utility, especially in sloughing sores. But as weakness is the attribute of sores in general, this medicine is to be regarded as almost generally serviceable; in proof of which I subjoin the following case:—There was a young woman in St. Bartholomew's Hospital with an ulcerated leg, which had sometimes been a little better, and at others worse again, during a period of 18 months. That the disease in this case depended on constitutional causes was rendered evident by her having, during that interval of time, suffered from ulcerated sore throat, and cutaneous eruptions and ulcerations. Her case had been treated in various ways; she had taken decoction of sarsaparilla, used mercury so as slightly to affect the mouth, taken nitric acid and decoction of bark, also large quantities of conium and hyoscyamus with a view to soothe nervous irritability, and had even tried arsenic, but all without producing any great or permanent benefit. I showed the case to an old surgeon of a provincial

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\* See a case of sinuous and irritable ulcer in *Surg. Observ.* vol. i. p. 172.

hospital,\* who said, "We should, in our hospital, give her the bark in the largest doses she could get down, even till it nauseated." She was ordered the sulphate of quinine, and the dose was increased to five or six grains three times a day, and under the administration of this medicine, the sores healed readily. The medicine being at this time scarce and high priced, she occasionally did not receive her full allowance, when the sores never failed to become deteriorated; so that the necessity for maintaining the full effect of the remedy was made evident. By perseverance, however, in the use of this medicine, a permanent recovery was obtained.

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\* Mr. Simmonds of Manchester.



## SECT. III.

### OF LOCAL DISEASES WHICH OCCUR IN PARTICULAR TEXTURES THROUGHOUT THE BODY.

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I NOW proceed to the third section of the arrangement of surgical diseases I have formed, viz., diseases of a nature similar to those already treated of, which may take place very generally throughout the body, because the structures in which they occur are very generally distributed, but which seem to require particular consideration on account of the peculiar circumstances that attend them.

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## CHAP. XIII.

IF local disease results from constitutional causes, it is likely that parts having the smallest share of vital energy, or the greatest degree of susceptibility, will be those that are chiefly affected. It is also probable that parts having a continuity of surface with the alimentary canal will be a frequent seat of such maladies. We in fact find that the bones, joints, absorbent vessels, and especially the skin, are more particularly subject to disease in disturbed states of health. Glandular parts also, perhaps from complexity of structure, or from sympathy, are very liable to become affected. I shall first treat

### *Of Diseases of the Absorbent Vessels and Glands.*

The absorbing vessels as well as their glands are very susceptible, and prone to inflammation in particular states of health. They then inflame even from trivial causes of irritation, and also transmit their inflammation to the parts in which they lie imbedded, as has been shown in the case of a person pricked by a clean sewing needle. (Chap. 9. § 1.) The inflammation in such instances extends not only upwards towards the termination of the absorbing system, but also downwards towards its commencement. as is evident in cases where the absorbents

inflammation from the festering which sometimes happens in the wound after venesection,\* and moreover, in the enlargement and suppuration of the popliteal glands which occasionally occur in consequence of diseases situated in the middle of the thigh, and in similar affections of the glands of the pelvis from diseases of the testes.† Many cases in surgery, inexplicable upon any other supposition, may be reasonably accounted for on these premises. Such was the case, I feel perfectly convinced, in the general œdema and abscesses which took place in the lower extremity of the Swedish sailor, whose external iliac artery was tied, as related in my *Surgical Observations*.‡ Shortly after this case had occurred, I saw a lady, the wife of an intelligent surgeon, whose lower extremity presented a facsimile of it in all respects. The whole limb was greatly œdematous, and abscesses had formed in front of the thigh, and in the ham. The disease had come on after parturition, and the patient was so much reduced by it that she was not expected to recover. She, however, did get well, and that even more rapidly than could have been anticipated, by measures which tended to tranquillize and improve the general state of her health. In the very first case in which I tied the femoral artery, irritation was communicated to a gland in its neighbourhood, which suppurated and broke, and also opened a communication between it and the artery. I am impressed with the belief, that many cases of puerperal œdema arise from irritation and imperfection of function of the absorbing vessels; and I have been surprised, in several instances where I have been consulted, at the comparative celerity with which these cases amended under a plan of treatment calculated to give tone and tranquillity to the general system. Of late it has been suggested, and indeed shown in several cases, that such affections may arise from disease of the veins causing obstruction to the return of the venous blood; but in these cases, the superficial anastomosing venous channels become and remain enlarged, a circumstance which is sufficiently declarative of the cause of the œdema. In many other instances, however, to some of which I shall presently advert, no such enlargement of the superficial veins is perceptible. In œdema produced by obstructed veins, so far as my experience has enabled me to judge, the swelling is by no means so pale as that occasioned by the impeded function of the lymphatic absorbing vessels; on the contrary, there is in

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\* Vide *Surg. Observ.* vol. iii. p. 135

† *Ibid.* vol. ii. p. 139.

‡ Vol. i. p. 333.

general more or less of that purplish hue of surface which may be produced by a ligature being tied tightly round a limb. I shall relate what may be regarded as rather an extreme case of oedema, apparently consequent upon obstructed veins, to illustrate this remark ;—An elderly gentleman had his hand, forearm, and lower three fourths of his arm swollen to a great degree. The swelling began from below, and gradually increased in size, and ascended the limb during three or four days, when it seemed to become stationary. The arm was of a dusky purplish hue, difficult to describe, but exactly resembling what ensues from the bite of a viper. A firm and painful enlargement could be distinguished, amidst the general swelling, on the inner side of the biceps muscle at the upper part of the arm, which seemed to indicate that the veins in this situation either caused or greatly participated in the disease. I advised the patient to remain constantly in bed, so as to facilitate the return of fluids from the swollen limb, which was placed horizontally, and covered with the bread-and-water poultice made with poppy-water. As the patient was much out of health, the chief attention was directed to its improvement; and under this treatment the swelling made no farther progress; but the skin became sore, and numerous superficial ulcers of small extent occurred, which, from the acrimony of their discharges, required to be cleansed and dressed twice a day. In about six weeks, the arm was so much reduced in bulk, and the sores so far healed, as to allow of the patient's getting up and supporting it in a sling. The induration on the inner edge of the biceps muscle remained much longer than elsewhere, but at length subsided. On the complete recovery of the patient, there was still considerable enlargement of the superficial veins of the upper part of the arm.

I have seen many cases of patients apparently affected with some disease about the hip rendering motion difficult, in which there was slight tumefaction in the glands of the groin, and in those accompanying the femoral vessels. The disease seemed in these cases to be consequent upon a disturbed state of health, ceasing on its improvement, and recurring upon a renewal of general indisposition. A young gentleman from Wales came to London evidently much out of health, and complaining of pain in the loins, hip, and thigh, which produced lameness. The inguinal glands were tender, and still slightly enlarged, although they had been more so. There was an enlargement to be felt on the inside of the thigh, in the track of the superficial absorbents, which was hard, painful, and evidently contained a fluid. The improvement of the general health seemed to be the first object of medical attention. Measures were accordingly



directed to this end. He was also recommended to keep the horizontal posture, and poultices were applied over the seat of the abscess, which soon became open by ulceration, and then spread into a foul sore. The sore, however, gradually assumed a healthy character, and eventually healed, so that at the end of between two and three months the patient went back into the country much improved in health. There he resumed his ordinary course of life, and within a year he again became lame, and for the second time returned to London, scarcely able to walk, and with an opinion that his hip-joint was diseased. There was a considerable degree of solid œdema on the outside of the upper part of the thigh, involving the buttock. By rest in a horizontal position, and measures directed to the improvement of the state of his alimentary organs, he got well even rapidly, so as to afford an assurance that there was no disease in the ligaments or bones of the hip-joint. He returned home with an urgent admonition to pay more attention than he had been accustomed to do to his diet and the state of his alimentary organs.

The glands which appertain to the very susceptible system of absorbent vessels are known to be liable to disorder from constitutional causes. They are subject to every variety of local malady,—to phlegmonous inflammation and consequent suppuration, to indolent tumefaction and subsequent suppuration, to morbid actions producing every variety of sarcomatous growth, and to scrofulous affections. In my *Surgical Observations*,\* I have related cases showing how frequently diseases of the absorbent glands proceed from a disturbed state of health caused or maintained by an unhealthy condition of the digestive organs, and how greatly such local diseases are benefited by means that improve the functions of the chylopoietic viscera. Upon these affections I shall not therefore enlarge in this place, but shall merely add a few words on the subject of scrofula.

### *Of Scrofula.*

I do not think we are warranted in calling every indolent and protracted disease by the name of scrofula. The diseases I recognise as of a genuinely scrofulous nature are characterized by being indolent for some time at their commencement, and afterwards assuming an active and occasionally a painful character, during which they suppurate and ulcerate. The pus secreted in these cases has a peculiar and curd-like appearance.

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\* Vol. i. p. 123.

The disease is commonly divided into *scrofula glandulosa*, *scrof. ossea*, and *scrof. cutanea*, by nosological writers. Under the head of cutaneous scrofula, I should only recognise the peculiar tumefaction of the upper lip which ulcerates, and certain chronic inflammations of the integuments which have a dusky hue, and usually occur over fasciæ: these suppurate slowly, and remain ulcerated for a great length of time. Scrofula is a disease seemingly peculiar to childhood, and rarely met with after puberty; but diseases of the absorbing glands occur at all periods of life. Scrofula may be regarded as the most pertinacious malady to which young persons are subject; yet the actions of the disease have a tendency to subside spontaneously, and soonest in proportion as the patient regains a tranquil state of health.

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## CHAP. XIV.

### *Of Local Nervous Affections.*

HAVING described diseases which owe their distinguishing characters to faulty actions of the sanguiferous and absorbing systems of vessels, I proceed to speak of those that are caused by faulty actions of nerves, and which may, like the former, occur in any part of the body.

§ 1. Local nervous torpor, and muscular weakness, or the opposite states of nervous excitement or pain, and of muscular convulsion or spasm, are complaints which may occur either separately or conjointly. In many cases, they seem to result from an affection of the brain; in others, from sympathy with the digestive organs; and in others, from causes acting locally on the nerves themselves. We do not know how it happens, that when different parts of the brain are morbidly affected, these should operate on different and remote parts of the body; but facts assure us that such is the case. Local diseases of the brain, as an effusion of blood into some part of its substance, produces various partial affections in remote members of the body. In one case we see the leg paralysed, and in another, the tongue, the muscles in every other part retaining their powers. Upon this datum we see how different parts of the brain may affect, or become affected by different parts of the body: for example, how ungrateful sounds may, through the medium of the brain, influence the secretions of the kidney; also, how diversity of affections of the brain may affect the different viscera, or become excited by them. Even diversity of thought or feeling produces

great variety of effects throughout the whole body. On the supposition of a single centre of nervous agency, Mr. Hunter could never explain satisfactorily the sympathies of different parts; but the discovery of M. Legallois, of numerous centres of nervous action, enables us now to understand most of the phenomena that present themselves. Of late years I have been in the habit of relating various cases to show that disorders of the alimentary organs may produce, by affecting the several portions of the medulla spinalis, an irritable or a paralytic state of the nerves of the neck, of the arm, of the loins, and of the lower limbs. The first I shall detail is one of wry neck. A young gentleman, when at school, was suddenly seized with irregular and convulsive actions in the muscles of his neck, which drew his ear towards the sternal end of his collar bone. Till I saw this case, I should scarcely have conceived it possible that the vertebral column in the human subject could be twisted to such a degree without injury to its fabric. The patient had been leeches and blistered, but the malady increased, and he was brought to London. I directed that he should be kept in a recumbent posture, with his head so supported as to require no effort on the part of the muscles which acted in so faulty a manner; for it must evidently be wrong to call upon muscles for exertion when they are either incompetent to act, or when their actions are conducted in a faulty manner. I also directed tepid fomentations to be applied over the contracted and morbidly affected muscles, the compresses being covered with dry flannel, so as to keep up a comfortable temperature, and produce the effect of a local tepid bath, being soothing to the feelings, and promotive of gentle perspiration. But my chief attention was directed to tranquillize and improve the state of the digestive organs, the functions of which were greatly disturbed, the tongue being extremely furred, and the discharges from the bowels very unhealthy. As this object was accomplished, the irritability of the muscles of the neck was relieved, so that in about eight days the patient was nearly well, and shortly afterwards recovered completely.

I have seen cases of a similar nature gradually subside of themselves, as the state of the patient's health became better. In general, however, wry neck is a disease that is difficult to cure; for it is confirmed by habit, and at length by certain alterations of structure induced by its continuance.\*

The next case I shall relate is that of a medical gentleman,

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\* There are different kinds of wry neck, and produced by various causes. I here refer only to one kind of this disease.



who lived freely, and paid very little attention to his alimentary organs. He was frequently admonished by a professional friend of his imprudence, and warned that some severe fit of illness would be the penalty of his irregularities. This warning was long neglected; but at last the calamity did come, and he found himself one morning deprived of the use of his right arm. He hastened to his adviser, and implored his assistance, promising that he would now strictly abide by his directions. Being provided with the medicines that were judged proper,—alterative doses of mercury, and gentle laxatives,—and having a plan of diet prescribed to him, he left his friend's house. For nearly a week he derived no apparent benefit from the course suggested, when he was seized with a bowel complaint, and on a sudden found himself again in possession of the perfect use of his arm.

In some cases, I have known the integuments of the chest so irritable as to be blistered by the slight friction of the clothes against them; and this state, as well as the spasms which occur in the intercostal muscles, and the pains that are felt in the parietes of the thorax, can only be referred to disturbance of the functions of the dorsal portion of the medulla spinalis and its nerves. The pains which are felt shooting through the chest from the sternum to the vertebral column seem often to proceed from an affection of the plexus of nerves which lies on the œsophagus.

The following case is an instance of a particular affection of the lumbar portion of the spinal cord and its nerves. A gentleman was brought to me from the country, whose lower limbs were completely useless from an atony of the parts supplied by the lumbar nerves. The sensibility of the parietes of the abdomen was so much diminished, that he said he knew not that he had any bowels. The muscles on the front of the thigh were quite powerless, and the integuments over them benumbed; yet he could bend and extend his foot, and was perfectly aware when the parts below the knee were touched, circumstances which showed that the sacral nerves were not materially affected. The alimentary organs of this patient were greatly out of order, and I gave him such advice as I conceived might bring them into a regular and healthy state. He then left me, being carried out as he had been carried into the house, and I saw no more of him for a year, when he again called on me, strutting into the room in a very peculiar manner, and directing my attention to the ease and power with which he walked: "I can walk as well as ever," said he, "and now I feel that I have bowels." Recollecting the circumstances of this case, I told the



patient he was not yet so well as he supposed, for I observed that the knees were constantly extended, and that, instead of bringing the foot straight forward, each step was made by swinging the whole limb round on the head of the thigh bone; which showed, if I may so express it, a kind of animal consciousness of the weakness of those muscles which are affixed to the knee-pan, and keep the "pregnant hinges of the knee" from yielding under the weight imposed on them. As there remained considerable weakness of the extensor muscles on the front of the thigh, I said, "there is one thing you cannot yet do; that is, stand with your knees bent." On making the attempt, he would instantly have fallen to the ground had he not supported himself with both his hands on a table that happened to be near him. The sacral portion of the spinal cord is also liable to be distinctly affected.

Instead of the diminution of nervous sensibility which has been remarked in the last case, I have seen in others great exaltation of the same function. There was a young woman in St. Bartholomew's hospital, who complained of such tenderness over the front of the abdomen, that she could not suffer it to be touched, screaming even when the hand approached it. She was also affected with hysterical breathing; and this, with various other symptoms, induced me to consider it as a case not of peritonitis, as at the outset it was believed to be, but of disordered nervous functions of the parts, depending on a disturbed state of the general health. The measures I prescribed were such as seemed calculated to tranquillize the system at large; and under this treatment she gradually improved. Great benefit was also derived from the application of blisters to the loins.

In many nervous affections occurring sympathetically or spontaneously, it seems as if there were no material impediment to the nerves of the part performing their functions properly; for I have known cases of persons, who, having lost their voice, regained it suddenly by having slight shocks of electricity sent through the recurrent nerves. In cases of inactivity of the extensor muscles of the fore-arm, also, in which the fingers and wrist are permanently bent by the predominant, but not undue, action of the flexors, I have known the equilibrium immediately restored between these two sets of muscles by means of electricity.

In cases of neuralgia, we find that sometimes the faulty actions of nerves which are productive of pain commence in their extremities, and are susceptible of being excited by the slightest touch. This is the only case in which the division of the trunk of a nerve, to detach its irritable extremity from the sensorium seems vindicable: and even here the operation is not likely to

be permanently useful.\* But in other instances of neuralgia, the pains affect even the trunks of nerves, or the branches in situations where no operation can be performed, even were it advisable: these cases, consequently, admit only of medical treatment. In such cases we have to investigate the cause of the malady, as suggested in the beginning of this chapter, since it is by the removal of the cause that the effects are likely to cease. Many of these cases of neuralgia get well spontaneously, apparently from some change taking place in the state of the general health; and many of them are evidently relieved by medicine. To show that these cases may be induced by a disturbed state of the general health, and especially by an affection of the alimentary organs, I shall relate the following instance:—A gentleman, a member of the medical profession, had formerly suffered from an attack of severe pain in the loins, for which he had been bled with apparent benefit; he, however, had a return of his complaint, which did not yield to this treatment, although it was carried to a considerable extent, 70 oz. of blood being taken away. He then tried opium, and this medicine he was taking in large doses, but without any advantage, when I first saw him. I recommended him to go to bed, thinking that an equable temperature might be useful; the diet was strictly regulated, and the natural actions of the bowels maintained; alterative doses of the pil. hydrarg. every second night, were prescribed, and, instead of the opium, three grs. of extract. conii and two of extract. hyoscyam. nig. were directed to be made into a pill, and taken at intervals to allay pain. As his bowels were cleared, however, their healthy secretions restored, and the stomach was no longer offended by the presence and chemical decomposition of food which it was unable to digest, he felt so much relieved that he did not think it necessary to take any of the pills. He kept his bed during one week, and refrained from exercise during another, when he found himself so completely recovered, and so assured that he should suffer no relapse, that he went into the country and remained free from complaint. I remember the case of another surgeon of eminence in London, who had an attack of most violent neuralgia in the front of his thigh. By means of a few doses of calomel and purgative medicines, and cleansing the *primæ viæ*, as he expressed it, he quickly and completely recovered.

Upon the subject of *tic douloureux* I have already delivered

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\* See a case in *Surg. Obs.* where the nerve of the ring finger was divided, vol. ii. p. 209.

my sentiments fully in my Surgical Observations,\* so that I do not think it necessary to discuss the subject further in this place. I shall only say, that to me *tic douloureux* appears in general to be as much a constitutional affection as gout or rheumatism, and that constitutional treatment is that which seems most likely to be advantageous in this as well as in nervous affections generally.

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## CHAP. XV.

### *Of Diseases of the Skin.*

§ 1. I HAVE already, in my Surgical Observations, endeavoured to excite the attention of the profession to the necessity there is in cutaneous diseases of preventing, as much as possible, that sympathetic irritation and derangement of function in the surface of the body, which is produced by disorders of the digestive organs. In cutaneous diseases it is also of importance to maintain an equal and natural state of perspiration; for its suppression is likely to be a cause of irritation. Tepid baths which soothe and cleanse the surface of the body are, on this account, very useful. For the maintenance of free cutaneous circulation a certain energy in the heart and arteries is requisite, and this should make us be on our guard, by no means to reduce the strength of persons suffering from diseases of the skin.

§ 2. Many forms of cutaneous disease are admitted into our hospitals, which appear to be mere consequences of weakness induced by want of food and febrile affections, in conjunction with cold and uncleanness; for they get well with no other remedies than the tepid bath, the equable and comfortable warmth of a bed, nourishing food, and regulation of the bowels.

In cases where there seems deficient perspiration, medicines which excite gentle diaphoresis are useful. There are, however, forms of skin disease in which perspiration is more than ordinarily abundant, and this state should be obviated by appropriate measures.

§ 3. When the skin becomes tender, or is denuded of its cuticle so as to grow sore, topical applications are requisite. We should cleanse, dry, and anoint, or with some light dressing

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\* Vide Surgical Observations. vol. ii.



cover the sore and surrounding surface. Cleansing is necessary, because the secretions are often acrid, and tend to increase the irritability of the part on which they lodge. It is proper perfectly to dry the part before anointing it; for a wet surface cannot be greased, nor can one that is anointed be acted on by watery secretions. Various topical applications are also employed as soothing or as stimulating remedies according to circumstances. Among the former I may mention that lard with the superacetate of lead, in the proportion of  $\frac{3}{4}$  of the latter to  $\frac{1}{4}$  of the former is a good sedative application. A watery mixture of opium may also be incorporated with lard for the same purpose. Among the latter, the most frequently used are solutions of the oxymuriate of quicksilver, tar-water, and water impregnated with sulphuretted hydrogen. A great many ointments are likewise in use as applications to various forms of cutaneous disease. Of those most commonly employed I may notice the ung. hydrarg. nitrat. with two thirds or three fourths of lard added to it; the white oxyde of quicksilver, the oxyde of zinc, the sulphur, and the tar ointment, according to circumstances, as stimulants in affections of the skin.

The discharges from many cutaneous affections are apt to concrete and form scabs on the surface, and, in some cases, if they are left undisturbed cicatrization will take place, and the skin become sound under them. Though this may sometimes happen, it is not generally the case, for the scabs are often found to act as irritants, and to protract the disease by confining the discharges last effused. It, therefore, becomes necessary to poultice the parts in order to soften and remove the scabs; after which, by the application of proper dressings, the occurrence of any new incrustation is prevented, and the irritable and diseased skin being allowed to relieve itself by secretion, the diseased actions gradually subside.

Sulphur in laxative doses is admitted to be very generally beneficial in cutaneous diseases, and both arsenic and argentum nitratum given internally have been reported to be of service. It is probable, that these medicines act chiefly by altering the state of the stomach. If this opinion be well founded, as I feel assured it is, we ought to prefer having recourse to other and more innocent medicines by which the same object may be as well accomplished, and which I have frequently known to succeed when the others had failed. In the treatment of cutaneous diseases generally, indeed, the principal attention should be given to put the alimentary organs into a tranquil and healthy state. We can scarcely see a reason why the skin should ever become the seat of any affection, except through the influence of the stomach. We are perpetually reminded that there is the

closest sympathy between the skin and the alimentary organs. The state of the skin varies in appearance and condition with the state of the stomach, from the first feeling of nausea to the instant of vomiting, and some persons in a few minutes after eating a mussel, will have the whole surface of their body covered with an eruption. This influence is also reciprocal; for soothing the skin, and exciting its healthy functions, seem often to have a beneficial effect on the alimentary organs.

§ 4. There is a peculiar disease occurring in the skin, which resembles the farcy in horses. Tubercles form at small distances from each other, the intervening skin becoming red and thickened. These tubercles ulcerate and give origin to foul sores, which, though they may be improved, do not seem susceptible of cure by local applications. The tubercles may often be felt connected by cord-like substances beneath the skin. This particular form of skin-disease was pointed out to me at an early period of my professional life, by the gentleman with whom I was educated, Sir C. Blicke, as a disease requiring mercury for its cure, and curable by that medicine. I have uniformly observed, that the disease has been relieved, in a remarkable degree, by alterative doses of the remedy; yet I have met with cases which did not get well, although it was pushed so far as greatly to affect the system. Alterative doses of the medicine, with endeavours to improve the general health by regulating the functions of the digestive organs are the means which seem to me best calculated for the cure of this disease.

#### *Of Infectious Diseases of the Skin.*

§ 5. Itch is an inflammation which receives its denomination from the intensity of its concomitant sensations. The disease terminates in vesicles, which are generally soon burst by scratching, and the fluid they contain being infectious, new points are rapidly inoculated, so that the disease often spreads by degrees, from the small district which it at first occupied, over the whole of the body.

I have always found this disease curable by sulphur in the course of 24 hours. The mode of using it as follows: equal parts of flowers of sulphur and of melted lard are to be mixed together, the ointment may be coloured with a little cinnabar, and scented with some essential oil. The patient standing before the fire is to anoint the whole surface of the skin, and especially those parts where the eruption is thickest, and the itching most violent. He is then without wiping off any of the ointment to dress himself in a complete suit of under garments, stockings, drawers, waistcoat with sleeves, and gloves, and over these he may, if he chooses, put a shirt or sleeping gown, and

go to bed, where he is to remain during 24 hours. After this interval he should get into a tepid bath, and being provided with mild soap, wash the skin quite clean. He should then dress in clean garments, and be very cautious not to subject himself to re-infection by using those he has formerly worn. This treatment will not be found to have removed the eruption nor the other traces of the disease, many of which are the effect of scratching; neither may it have removed entirely all sense of itchiness in the skin, which in many cases is the result of the patient's belief, that there are causes adequate to produce it, and proceeds therefore from the state of the mind; but all the infectious properties of the discharge will be destroyed by it, and the disease will cease.

There is a kind of cutaneous eruption which very greatly resembles the true itch, and in some cases apparently results from infection, though in general it is not communicable in that way. This complaint is not curable by sulphur. The disease, however, gets well under the use of measures calculated to produce tranquillity in the skin. I could relate a number of instances of this kind of disease, but one will be sufficient:—A gentleman consulted me on account of a disease of the skin which was supposed to be the itch, and with which he had been affected for between three and four years. Sulphur had been several times tried, but without any permanent benefit; and he had burnt his wardrobe three several times with a view to escape re-infection. This satisfied me that the disease was not itch; and it readily yielded to measures directed to induce a tranquil state of the skin and alimentary organs, such as the regulation of the diet, and of the functions of the bowels, and the occasional use of the tepid bath.

§ 5. The porrigo or scalled-head is an inflammation with a papulous eruption from which oozes a kind of mucilaginous discharge, which has an infectious quality, for if a little of it be applied to the skin of the arm or the neck, a regular circle of eruptions is produced in consequence. This circumstance gave rise to the popular name for the disease, the *ring-worm*. The eruption upon the hairy scalp, however, does not in general assume this arrangement.

Porrigo is a disease that will gradually cease of itself, and which does not spread except by inoculation. It is, therefore, advisable to keep the head, when affected with it, closely shaven, so that no stubble of hair may remain to entangle the discharge and communicate the infection. This measure also affords an opportunity of washing away all that exudes from the papulæ, night and morning, with mild soap and water. After each time of washing, the parts should be gently bathed with tepid water,



and the surface dried with a soft cloth. The part should then be anointed with a mild ointment, (the unguent. oxid. hydrarg. præcip. alb. will be found as good as any,) and over the part a piece of clean soft linen should be laid, the head being kept covered with a cap or wig.

A vast number of applications are recommended for this disease. There are some cases of it which soon get well under the simplest treatment, and there are others which continue for a long time under the most complicated measures. It appears to me that we sometimes prolong the disease by our attempts to cure it,—that our stimulating remedies failing to act as corrigents, continue excitement in the diseased parts. When the disease is of very long standing, I believe it is generally owing to the state of the patient's health tending to maintain cutaneous irritation. Some cases of the disease presenting that variety of character termed *porrigo lupina*, which had been unquestionably prolonged by the state of the patient's health, were admitted into St. Bartholomew's Hospital. In these the head was covered with a hillock of concrete scurf, which required to be softened with poultices before it could be removed. The scalp was found so generally sore that it was necessary to cover it with simple dressings; the lupine shape of the eruptions was, however, visible in many patches scattered over the body. In these cases the disease had endured for a very considerable length of time; yet it readily got well by the use of simple dressings, and by measures calculated to tranquillize cutaneous irritation in general.

The simple treatment I have been recommending is particularly applicable to the *porrigo decalvans*, in which, though there is no eruption, nor visible discharge, it is highly probable that infectious matter is poured out, as the disease is communicated from place to place, and from one individual to another.

## CHAP. XVI.

### *Of the Diseases of Bones.*

BEFORE we proceed to consider the diseases of bones, it seems necessary to advert to the effects of pressure upon unyielding parts; for unless these be understood, many circumstances relating to the progress of disease in bone will be unintelligible.

§ 1. Pressure in a slight degree upon the soft parts produ-



ces irritation and inflammation, as is manifest when the edge of a splint which is not properly guarded, is allowed to press upon the skin. In this case, an inflammation, corresponding in form to the exposed surface of the splint, takes place. If the pressure be continued, or its degree augmented, the actions of the absorbing system are excited, and ulceration supervenes. It is only necessary to add farther, that pressure in a still greater degree will cause mortification, of which sufficient instances have been already mentioned.

Bones, being essentially the same in structure as other parts of the body, will of course be subject to the same diseases, though these, no doubt, will be modified in consequence of the minuteness of the blood-vessels and nerves, and the greater compactness of the structure of bones.

### *Of Inflammation of Bones.*

§ 2. Chronic inflammation, occurring in bones, produces a gradual enlargement of their substance, in the same way as it does when soft parts are affected; and when the disease ceases, bones, like soft parts, diminish, but seldom regain exactly their pristine size and figure. In bones that have been affected with chronic inflammation, the increased deposition does not appear to have taken place on their surface, but interstitially throughout every part of their parietes.

§ 3. Phlegmonous inflammation, occurring in a bone, may, as in soft parts, end in an abscess. It might be expected that such an occurrence was more likely to take place in the medullary and spongy structure, than in the compact walls of a bone; and a striking and important instance of the truth of this opinion is to be met with in the suppuration of the diploe of the skull, which is occasionally the consequence of a blow upon the head. In this case, local pain in the bone is experienced, and, as matter forms, the pericranium is detached, and the outer table of the skull perishes. These circumstances enable the surgeon to decide upon the nature of the case; for if the bone be bare, he sees what is going on, and if the integuments be entire, the effusion of a fluid, occasioning a tumefaction of the scalp, induces him to suspect a separation of the pericranium, and to obtain assurance of the fact by an incision down to the bone. If the external table of the skull be now perforated with the trephine, the portion of bone within the circle of the instrument comes away, and the abscess being opened, the matter is discharged from the diploe, and the patient may do well. Some exfoliation of the external table may afterwards take place, but this is generally of no great moment. If, on the contrary, the abscess be not opened, the matter, being pent up between the

tables of the cranium, presses in all directions, aggravating inflammation, and thereby increasing suppuration, by which the amount of pressure is still farther augmented. Absorption of the bone then takes place, usually along the course of the diploe, in which the vessels are more numerous, and the susceptibility greater than in the outer or inner table. In this way, if the same causes continue to operate, the matter will extend itself, so as at last to pervade, as I have several times seen, nearly the whole of the cancellous structure of the cranium. In the course of this disease, and when it has continued some time, it may be naturally supposed that the tables themselves of the skull will suffer absorption; and we actually find that small portions of the inner as well as of the outer table are taken away very generally throughout the extent of the disease, and that the matter escaping by these little apertures becomes diffused beneath the pericranium on the outside, and over the dura mater on the inside of the skull. The whole upper part of the cranium, when macerated, appears something like a sieve, in cases of this description.

§ 4. That inflammation of a bone may occasion its mortification, cannot be doubted; but it may be questioned whether so vehement a diseased action as that which occasions the death of soft parts ever occurs in bones. Any excess of action which weakens the life of parts possessing small vessels and nerves, is likely to cause their destruction; and when we consider the compactness of the structure of bones, and the great probability of obstruction occurring to the circulation in their minute vessels, we cannot wonder at the well-known fact, that the death of bone is a very frequent occurrence.\* Mortification of bone is also likely to ensue from any cause depriving it of its proper supply of blood from the periosteum. The death of any portion of bone is not, however, a necessary consequence of the detachment of the periosteum, as appears evidently in cases of syphilitic nodes, in which fluid is effused beneath that membrane so as to raise it from the bone. In pseudo-syphilitic nodes, I have known not only fluid effused, but heaps of bony matter irregularly deposited by the periosteum, without exfoliation or any other circumstance occurring which could induce a supposition that any portion of the bone had perished.

§ 5. Any number of lamellæ on the surface of a bone having perished, the dead parts are separated and thrown off in the

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\* The part of a bone which perishes is not called a slough. The disease is allowed to be a mortification, but we borrow a word from the Greek language, and call it technically *necrosis*; and the dead part, when detached, is called a *sequestra*.

same manner as the slough consequent to the death of soft parts is detached. In the Hunterian collection at the Royal College of Surgeons in London, there is a series of preparations which illustrates this part of the subject very satisfactorily. Having divided and reflected the parts covering the shank bone of an ass, Mr. Hunter destroyed the life of these bones to different depths by the application of the cautery, and then suffered the wound in the integuments to heal. The limbs of the animal were afterwards injected, and showed the following circumstances in their different stages ;—1st, A space between the sequestra and the sound bone. 2d, The growth of granulations in this space. 3d, The formation of bone by the periosteum, so as to include the sequestra in an osseous cavity : and 4th, The removal of the sequestra by the living parts in contact with it.

In the detachment of sequestræ, a space is created in the circumference, and from thence progressively towards the centre. Granulations spring up from the living parts in this interval, and grow successively as its extent increases. It seems, indeed, as if granulations had, by means of their absorbents, a considerable share in producing the spaces we observe between living and dead parts ; for even when the soft parts are concerned, if there be tardiness in the growth of granulations, the detachment of a slough is a very tedious process. Why this process is carried on in the manner now described, we know not ; but it is evidently accomplished in the same way, and is influenced by like circumstances both in the bones and in the soft parts. When we consider how tardily the vessels of bone produce granulations, we cannot wonder at the time which elapses before sequestræ are detached. When, at last, sequestræ become loose, and we remove them, we observe nothing in the space which they occupied but a granulated surface.

When necrosis occurs in the inside of a bone, the sequestra is detached in the same manner ; but the dead portion, being in this case confined, acts like a foreign body, and keeps up irritation in the parts that surround it. Superficial sequestræ, indeed, are often, by the natural processes, placed in similar circumstances, for they are frequently wedged in by new and irregular depositions of bone formed around and over them by the actions of the excited periosteum.

When the spongy extremities of long bones, or the protuberant parts of broad ones, are affected with necrosis, the dead portion is rarely thrown off in a mass ; it commonly breaks to pieces, and comes away with the discharge ; and the disease when thus characterized has been called a mouldering or crumbling caries.

§ 6. In inflammation of bone, it may be expected that the pe-



riosteum will be especially affected. The inflammatory actions, indeed, may run so high in the periosteum as to occasion its detachment from the bone; and if this happen to a great extent, the bone will perish in a corresponding degree. It is from this cause that the entire shaft of a bone sometimes suddenly perishes. In the cases of this kind which I have seen, the patients all laboured under severe constitutional disturbance at the time of the event occurring.

As the vessels and nerves that supplied a bone which has perished still remain distributed to the periosteum, after the violent actions have subsided, this membrane begins to form a new bone around the old one, and the vascular lining of the new formation absorbs the old shaft. In these cases, the new bone is misshapen, irregular, and massy; but after a series of years, perhaps three or four, the irritation ceases, and the new bone, as the old one is absorbed, gradually acquires the size and form which the latter possessed originally. Long before this process is completed, however, patients, to get rid of the annoyance of their painful and, for the time, useless limbs, frequently solicit amputation, and thus afford an opportunity of observing the appearances which have been described; the limb is found supplied with a new bone containing the relics, to a greater or less extent, according to the time which has elapsed, of the old one.

§ 7. The powers of the periosteum and probably of the contiguous parts which assume similar actions, to form bone, is often evinced in cases where no necrosis either superficial or internal has taken place. We often find osseous depositions upon the surface of bones that appear quite free from disease. This is manifest in some nodes.

§ 8. The death of a bone necessarily implies the detachment of the periosteum; but in some cases the periosteum may acquire increased vascularity and become separated without necrosis having preceded. I have a preparation in my possession which demonstrates this fact. In this case inflammation had taken place in the interior of the bone, and a small abscess formed in its cancellous structure; the periosteum is highly vascular and detached from the bone, which is injected throughout;—a proof that no part of it had perished.

§ 9. When soft parts perish, they putrefy, and the absorbents will not take up the decomposing mass. But when bone perishes, the sequestra will be entirely removed, provided it is in contact with living parts whose absorbents can act upon it. The cases in which the entire shaft of a bone is removed, already alluded to, may render farther illustration of this fact almost unnecessary. To show the power of granulations in absorbing bone, however, I may mention that I have seen one



half of the fang of a transplanted tooth removed in consequence of the gum having produced a fungous growth which came in contact with it. I may farther refer to the fungus growing from the surface of the dura mater, which very rapidly absorbs the cranium and sprouts up through the aperture it has made. These circumstances were not attended to till Mr. Hunter's time, and may not be familiar to every surgeon even at present.

§ 10. Disease and irritation in bones are apt to be communicated to surrounding parts. Allusion to this circumstance has already been made while speaking on the subject of œdema. (Chap. xi. § 2.)

In some cases of diseased bones, jelly has sometimes been effused, and osseous matter deposited throughout almost the whole of the cellular substance of limbs.

In necrosis abscesses frequently form and break outwardly, leaving sinuses that lead down to the bone; or the abscess is succeeded by ulceration, and the bone is thus denuded. When from such causes the living parts are removed beyond the contact of the dead, they cannot absorb the sequestra, and the aid of surgery then becomes necessary for the purpose of taking it away.

### *Treatment.*

§ 11. The treatment of inflammatory affections of bones is the same as that which is employed in similar disorders of soft parts, and need not be repeated. However, as topical applications cannot be expected to have such influence on the bones as they possess on soft and susceptible parts, we recur to them rarely, whilst we employ local blood-letting and counter-irritation more generally and perseveringly, in diseases of bones.

During that stage of the disease which precedes and produces necrosis, and even during the progress of the processes by which sequestræ are detached, our endeavour should be to soothe irritation; and, whenever the sequestræ are loose, if living parts are not or be not likely to come in contact with them, our duty is to remove them, as they must act like foreign bodies and prove a source of continued irritation. The aching pain, and the formation of abscesses around the body of the bone, that accompany loose sequestræ, are proofs of the irritation which they keep up.\*

When the tibia is the bone diseased, it may be laid bare readily; and in the case of a superficial sequestra, so much of

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\* The Memoirs of the French Academy of Surgery may be particularly referred to for much valuable information on the treatment of diseases of the bones.

the new bone which has been formed by the periosteum removed as appears necessary to take away the dead piece ; or if the sequestra be in the interior, such a portion of the walls of the old bone as may be required to give it exit, may be taken away.

But as such operations cannot be performed on the thigh-bone, and as necrosis in the tibia does well without them in those cases where there has not been a separation of the living parts from the dead bone, or where, although there has, they can be brought into contact again, I hold it right to dwell more particularly on this part of the subject, with a view to induce a consideration of the resources of nature in cases of necrosis, and to inspire a greater degree of confidence than is usually placed in their efficacy. That sequestræ will act as foreign bodies, and induce irritation, must be granted ; yet this consequence may in general be prevented by some kind of counter-irritation being instituted by the surgeon. It has, indeed, often surprised me to see how effectually irritation was combated by means of an issue, or some similar remedy. When cases get well by such measures, it must be allowed that the surgeon may have been mistaken in his opinion as to their true nature. Yet as the instances of recovery I have seen are numerous, and so exactly accord with those which, from their fatal termination, or the performance of amputation, were demonstrated to be cases of necrosis, I think myself warranted in representing the subject as I am now doing, and I can in no way so briefly or clearly explain myself as by selecting and relating two cases.

A gentleman about 30 years of age had, for nearly two years, suffered, in a greater or less degree, from lameness of one of his knees. His malady never absolutely confined him, but none of the numerous remedies he had tried, procured him effectual relief. The knee joint was perfectly moveable and sound, and I could perceive nothing wrong in its vicinity, except an enlargement of the lower end of the thigh-bone a little above the condyles. I concluded that his disease was necrosis at this part, and recommended him to apply a blister of an oval form over the apparent seat of the affection, and to keep it open by dressing it with savine ointment. This treatment, in the course of three weeks, so completely removed all uneasiness about the bone, and so perfectly relieved him from his lameness, that I was confirmed in my idea of the nature of the disease. I found it impossible, however, to prevail on the patient to continue so troublesome a remedy as an open blister, for any length of time. In six months the uneasiness and lameness returned, and a blister was again applied, and kept open ; and with the same success as before. About ten months after this second attack, I was desired to see the patient in consultation. His pain had re-

turned, but another surgeon, who entertained different opinions on the nature of the disorder, had dissuaded him from applying the blister. His health was probably disturbed at this time ; for the local pains were more severe than usual, and seemed like those of rheumatism. He also complained of severe rheumatic pains in the shoulders and arms ; he was feverish, and had been confined to his chamber. Under these circumstances a considerable swelling had formed, ascending from the knee as far as the middle of the thigh, where it was very prominent, and threatened to become open by a process partly ulcerative, and partly gangrenous. I told his medical attendants that, if my opinion were to be followed, I had made up my mind upon the propriety of opening an issue opposite to that part of the thigh bone in which I considered the cause of the disease to be situated. This, with measures calculated to tranquillize the disturbance of his general health, was all I had to recommend under present circumstances. I was asked if I conceived it possible that this unhealthy inflammatory swelling, which threatened to open of itself, could by that or any other remedy be dispersed. I answered, that I thought it was possible, because I believed the disease of the bone, and the subsequent irritation and inflammation of the soft parts, to stand to each other in the relation of cause and effect. Accordingly, a portion of skin was destroyed by the *potassa c. calce*, and a bread-and-water poultice was applied over the tumefied parts. Under this treatment the inflammatory swelling subsided, the pains ceased, and in about two months the patient was able to move about, and shortly after to walk as well as ever. As he found but little inconvenience from the issue, and could keep it open with very little trouble, and as he was also forewarned by previous experience of the necessity of so doing, he did not allow it to heal until two years had elapsed. In this time it is probable that the sequestra had been entirely absorbed, for he never afterwards had any uneasiness in the limb.

A gentleman about 50 years of age, had been lame for nearly three years with a disease which he considered as a scrofulous affection of the knee. For this he had visited various bathing places, and tried many different medicines and mineral waters without avail. The knee joint, however, on examination, appeared to be quite free from disease, but it was so bent that he could not use the limb, and was unable to move except on crutches. He was a corpulent man, and had a sickly aspect. The only circumstance I could observe in reference to the cause of his disease, was an enlargement of the lower part of the thigh bone. Abscesses had formed and broken around this part, and there were sinuses opening by the side of either ham-string, and



one in the ham, where all the structures were much thickened. The discharge from these sinuses was considerable, and of various qualities. I established an issue opposite to the enlarged part of the thigh bone, and recommended the pulp of bread poultice to be applied to the part at night to appease irritation. The benefit derived from these measures in the course of five or six weeks was very remarkable. The knee became straighter, the discharge from the sinuses trivial in amount, and their apertures showed a disposition to close; the skin around became pale and pliant, and there was a manifest diminution in the thickening of the parts about the bone, so that its form and enlargement could be more distinctly felt. I saw this patient six months afterwards, when his knee was so far recovered, that I told him I did not doubt but he would regain the perfect use of his limb, by continuing the treatment during a sufficient length of time. Shortly after this he was taken very ill, and was confined to his bed. His disorder seemed chiefly in his bowels; no treatment proved of any avail, and he died. The body was examined after death. In the abdominal cavity there was abundant evidence of the viscera having long been the seat of disorder and irritation. The liver and spleen were both diseased, and there were gall-stones in the gall-bladder. The joint of the knee was sound; but on sawing the lower end of the thigh bone lengthwise, in halves, a considerable sequestra was discovered firmly incased in new bone.

It appears, then, to me, that the practice of surgery in necrosis consists in allaying irritation. Though the sequestra be detached, if it remain in contact with living parts, the same plan of treatment should still be pursued. Counter-irritation is generally to be instituted by means of an issue. If, in cases of necrosis, sinuses can be brought to close, and ulcers to heal, we may safely trust the removal of the dead bone to nature's operations. Similar treatment is applicable to the diseases of bones in general, and likewise to the diseases of the periosteum. The cases of affections of these parts received into St. Bartholomew's Hospital of late years, have been uniformly treated upon this plan, and with a degree of success which warrants my strongest recommendation of it generally.

### *Of Diseases of the Periosteum.*

§ 2. Disease or thickening of the periosteum may be very readily, and is very frequently, mistaken for disease of bone. In a state of irritation, the periosteum may deposit exuberant earth, and form a node; or it may secede to a certain extent from the bone it invests, as has already been said, without causing any disease in the bone itself. This is evident in some

cases of nodes. The periosteum, when generally affected, may, without becoming detached, impairing the nutrition, or in any way altering the healthy condition of a bone, produce small depositions of osseous matter along its surface, without causing it to appear enlarged generally. I have often seen this in single bones; but in the museum at the College of Surgeons there is a skeleton where osseous depositions have taken place very generally throughout the body. The circumstance has been supposed to be owing to venereal disease, but it is certainly not due to this cause; for the venereal disease does not affect the bones indiscriminately, nor throughout their whole extent, and is, moreover, an ulcerative disease, a condition that does not appear in any part of the skeleton referred to.

§ 13. The periosteum sometimes produces a fungous growth, which causing ulceration to take place externally, may induce us to suppose that the disease is connected with, and depends on, a morbid state of the bone. A man who had suffered much, and for a great length of time, from the irritation of a disease which was presumed to be in the bone of the leg, wished to have the limb amputated. The operation was done; but upon injecting the member minutely, every part of the bone was found pervaded by the injection, and to all appearance healthy, the periosteum alone being found the seat of disease, and affected with a morbid growth. The stump had scarcely healed, when a similar affection took place in the tibia of the other leg, and seemed to make progress in spite of all the measures adopted to oppose it. One of the students at the hospital mentioned this case to me as one of extraordinary interest, inasmuch as no evident disorder of the system could be detected. As it was impossible, however, to account for the circumstances of the case upon any other supposition than that the local affection arose from constitutional causes, the patient was put upon a plan of strict regimen in regard to diet, the bowels were kept acting regularly, without being irritated, by means of aperient medicines, whilst the decoction of sarsaparilla, with 5 grs. of pil. hydrarg. every night, were prescribed. These medicines did not induce either languor or febrile irritation, and under their use the patient got well, and was discharged from the hospital. The students who were interested in this man's case made subsequent inquiries after the patient, and learnt that, after some months, the disease returned in a slight degree, but was soon put a stop to by recurring to the former plan of treatment. Diseases of the periosteum, like those of tendinous and ligamentous parts in general, most frequently result from constitutional causes.

*Of Peculiar or Specific Diseases of Bone and Periosteum.*

Besides the diseases already described as attacking these parts, and which may be considered as of a common character, the vascular parts of bones are liable to those specific diseases with which soft parts are affected.

§ 14. Scrofula generally attacks the spongy parts of bones, and with circumstances similar to those which characterize the affection when it occurs in soft parts. At its commencement, the disease is of an indolent nature, but becomes in its progress more active and painful. The extremities of bones composing a joint, when affected with scrofula, appear enlarged, though this is not actually the case: they remain in general unchanged in size until the disease has extended throughout their entire substance. The cartilages are then more or less absorbed, and the joint in consequence partakes of the malady. In examining scrofulous bones, we find a kind of matter secreted or deposited in their interstices, similar to the curd-like substance contained in absorbent glands when affected in the same manner. Sometimes, however, a different kind of matter is secreted, and the bone seems to have been more or less removed by an ulcerative process. Scrofulous bones contain but little earthy matter, so that, when macerated and dried, they are found to be very light and easily crushed. If they be injected with fine injection, they appear more than usually vascular. It is probable that diseased actions of the vessels tend to produce the peculiar secretion we have remarked, and to lessen the deposition of phosphate of lime, which is the effect of their healthy functions.

§ 15. The venereal disease begins first in the periosteum, and then attacks the superficies of bones of the firmest texture, where they lie nearest the surface of the body. The shins and elbows are, therefore, of all other parts, those that are most apt to be affected. The bones of the cranium are also liable to the disease. True syphilitic ulceration begins on the surface; it also first occurs in a small district, and extends in its circumference, and deepens at its bottom. The disease affects a bone as it does the skin, producing irritation and inflammation, which end in ulceration. The disease is regularly progressive till arrested by mercury. In specimens of bones affected with true syphilis, that part alone where the ulcerative process has taken place appears diseased; the rest is healthy. In different crania which Mr. Pott had preserved, and which he gave to me, many venereal ulcers are to be seen, some of them so deep as to have exposed even the dura mater. Such specimens cannot, I believe, be obtained now, for the venereal disease seems to have been in a great degree exterminated, or is not suffered to pro-



ceed any great lengths, in consequence of the remedy being so generally and immediately employed. Syphilitic diseases of bones are attended with a peculiar pain, which the patients generally characterize by the term gnawing. It is fixed in the diseased part, and does not shift about like the pains of rheumatism. These circumstances deserve attention, because it is still very common to consider many nodes and diseases of bones as of a syphilitic nature which are not really so. and cannot be cured by mercury.

### *Of Rickets.*

§ 15. In weakly children there is sometimes a smaller portion of earth deposited in the bones than is requisite to give them firmness and permanency of figure. Their natural curvatures, therefore, increase: the thighs and legs bend forwards, sometimes outwards; the collar-bones advance in the middle; and the chest and the pelvis are liable to great alterations of form from this soft and yielding state of the bones. The naturally softer parts of the long bones, which expand to form the joints, also spread and become deformed, from the effects of pressure. The disease characterized by these changes is called rickets, which, however, cannot be regarded as a malady of bones; for in them there are no marks of unsoundness, and, when the general system becomes invigorated, they regain their proper firmness, as they will, also, their natural form, if the pressure which produced and tends to perpetuate their deformity be removed. It is a circumstance worthy of remark, that in rickety children, as the health is re-established, the bones which have become curved are strengthened by the deposition of osseous matter along their lesser arches, where the wall often becomes of surprising thickness, while the extenuation of the opposite side remains unaltered.

### *Treatment of Rickets.*

§ 16. In the treatment of rickets we should endeavour to invigorate the constitution in every possible way, while we avoid those causes which, in the soft state of the bones, tend to produce or to increase their deformity. It has been proposed to give the phosphate of lime internally; but we have reason to suppose that the disease is not owing to any deficiency of the materials, but of the proper actions of the arterious system by the agency of which earthy matter is deposited.

### *Of Mollities Ossium.*

§ 17. The bones of adults in some rare instances become

soft, even in an extreme degree.\* This disease, which is called mollities ossium, occurs in both sexes; and in the female it has been productive of such great deformity of the pelvis as to render paturition impossible. Mr. Hunter had an opportunity of injecting and examining the arm of a person who died with mollities ossium, and found the bones vascular, with a kind of curd-like matter deposited throughout them. It seems, therefore, that in this disease the vessels fail in their natural office—that of secreting earth of bone, and assume a new and unhealthy action.

§ 18. The opportunities of investigating this disease are so rare, and its causes are involved in so much obscurity, that I know not of any plausible mode having been proposed for its treatment. The disease seems to have pursued its own course, unaffected by any medical treatment that has been instituted in the cases on record.

### *Of Fragilitas Ossium.*

§ 19. The bones of adults have been broken by slight causes, even by the action of their own muscles, and as this has happened to different bones of the same individual, it would appear that the bones wanted their proper strength, from some cause that acted upon them simultaneously. Such a state of the bones has been termed fragilitas ossium. From what I have seen of the anatomical structure of bones in this fragile condition, I am inclined to believe that they are affected with no morbid action. Their disorder seems to depend on a deficient secretion of their earthy principles,—there is earth enough deposited to maintain their natural forms, but not sufficient to give them their ordinary and proper degree of strength.

### *Of Exostosis.*

§ 20. The vessels of bone, or of parts in their contiguity, sometimes assume diseased actions, and produce bony depositions of various kinds, which have, however, all been included under the general denomination of exostosis.

Some of these *splints*, or bony growths, project among the muscles, embarrass them in their actions, and often excite irritation. Of such splints some appear to be produced from the periosteum, they not being consolidated to the bone, whilst others appear to be growths from the bone itself.

I have seen the progress of many of these bony growths

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\* To show the extent of deformity, the student may refer to a case related by Mr. Thompson, in the *Medical Observations and Enquiries*. (vol. v. p. 257.), to which a drawing is annexed.

checked by the treatment which is commonly instituted to counteract local vascular increased actions. If they do not yield to this plan, but continue to increase, they may in many cases be removed with success, and as they generally arise from a narrow base, the operation is one of little difficulty in so far as relates to the bone. Osseous growths, however, may spring from an extent of surface, and yet have nothing specific in their nature adequate to induce similar disease in the deeper and surrounding parts, or which should deter us from taking them away. In the cases which I have myself seen where these bony growths were removed, whatever the nature of their attachment, they showed no disposition to return.

There is another kind of osseous, or rather ivory-like, growth, which we find attached to bones, and which appears to spring from them. These very hard substances are produced from a vascular pulp, proceeding from the periosteum, the vessels of which secrete phosphate of lime, and convert it into a mass, having the same density as the bone of the teeth, or ivory. These substances do not, after a certain time, increase in size, and may be removed without risk of re-production. There are other cases in which earthy matter is irregularly deposited, without, however, seeming to be attached to, or being dependent on any disease of the bone itself. When such depositions take place upon one bone only, they may arise from some local circumstance of irritation, and require topical applications for their cure; but when they occur on several bones of the body, they are produced by constitutional causes, and are not likely to be remedied by local treatment.

There are instances where these depositions are found very generally throughout the body, and to an extent that cannot but excite our surprise. The instances of trivial degrees of this disorder are not unfrequent. Young persons, and some even who are advanced in life, may have earth deposited upon the extremities of different bones. Local applications seem to have little or no effect in arresting the progress of the deposition, or in dispersing it after it has taken place. These depositions commonly soon become stationary, and continue so for a great length of time; in some instances, however, apparently from a change of constitution, they decrease.

As the disposition to a very general deposition of osseous substance must, notwithstanding the cases that are on record, be considered as a disorder of rather rare occurrence, I shall mention the particulars of an instance of it which I met with, as I shall thus have an opportunity of communicating some circumstances I have noted both in this and other similar cases. A youth of about fourteen years of age was brought to me,



whose back was greatly deformed by irregular hillocks of earthy matter heaped up upon the spinous processes of the vertebræ. The ligamentum nuchæ was ossified, so that his head was immoveably fixed, being drawn backwards, and slightly inclined to one side. There were exostoses on the os brachii of both arms; and the tendinous margins of the axillæ were converted into bone, and pinioned his arms so closely to his sides that it was difficult to insinuate the fold of a napkin between them and his chest. There was an exostosis on the pelvis, between the sacrum and os innominatum, and various others had formed at different times and disappeared, but those which I have mentioned were permanent. Being a robust and spirited youth, he was disposed to exertion; and if, in a forcible effort to accomplish any purpose, which his manacled situation obliged him often to make, he accidentally struck his head, or any projection of a bone, a temporary deposition of earthy substance in the injured part was always the result. He had had the toothach a little before I saw him, and the remains of an exostosis, which had been considerable, still appeared on the lower jaw. Thinking that such disorders could not be accounted as belonging to the bones, but were rather to be regarded as the effect of a prevalent disposition in the system to eliminate from the circulation and deposit the earth of bone upon the excitement of inflammatory actions, I wished to know whether this depended on the modes of action which the affected parts assumed, or on a too great redundancy of the earthy principles of bone in the circulating fluids. With a view to come to a conclusion upon the latter point, I examined the urine of this youth, and found that the oxalate of ammonia produced scarcely any perceptible precipitation of lime. On dropping in lime-water, a faint but permanent cloud of phosphate of lime was produced. In the urine of another person, on the contrary, abundance of oxalate of lime was thrown down by the addition of oxalic acid, and copious clouds of phosphate of lime were produced by the addition of lime-water; so redundant, indeed, was the phosphoric acid in this urine, which I believed to be healthy, that these clouds were several times re-dissolved before the acid was completely saturated, and the precipitate became permanent. Two years after the time I first saw him, the youth came to London again, and the exostoses which I have described seemed to be pretty much in the same state; several new ones, however, had formed on the extremities, one, in particular, extended itself from the pelvis along the thigh in the direction of the sartorius muscle, and impeded the motions of the limb. The urine was again repeatedly examined by myself, and, among several others, by Sir Humphry Davy, and with the same results as before. I now di-

rected him to take, in divided doses, ʒj. of phosphoric acid daily, dissolved in such a quantity of water as it would slightly acidulate, with the addition of some sugar. Whilst he continued this medicine his urine resembled that of other persons, containing the usual proportion of phosphate of lime, with a surplus of phosphoric acid. After about a month the patient discontinued the medicine, without, however, apprising me of what had been done ; yet I detected it immediately, by finding neither lime nor phosphoric acid in the urine, as I had done at my last visit. I argued against the absurdity of this conduct, but in vain. The patient and his friends determined that no more medicine should be taken.

I have, in several slighter cases of a tendency in the system to osseous deposition, which occurred in the hospital, remarked the same deficiency of lime and phosphoric acid in the urine.

I have, however, met with other cases of exostosis, where the depositions of bony matter were numerous and of a large size, in which there was no want either of lime or phosphoric acid in the urine.

### *Fungus Ossium.*

§ 21. The vessels of bone may assume locally de ceased actions of a specifically morbid nature, and produce an intractable and often fatal disease. This disease I have been accustomed to denominate fungus ossium. Of late it has been asserted that the malady commences in the medullary membrane. I have not myself had an opportunity of ascertaining whether this be founded in fact or not. All I have remarked is, that the fungus ossium appears in a small district upon the surface of a bone. From this a vascular fungus first sprouts up, but its vessels soon deposit earthy matter irregularly throughout it, and convert it into a bony mass. The disease spreads in its circumference, and penetrates deeper and deeper into the substance of the bone affected, owing to the contiguous parts assuming similar morbid actions, whilst the rest of the bone remains apparently quite healthy. As the disease spreads continually, the mass of fungus acquires an enormous size. In a case of this description, where the disease occurred in the thigh, I made an issue at its commencement, and whilst yet uncertain of its true nature, supposing it might be an irregular deposition of earthy matter in consequence of internal disease of the bone. When, however, from the unabating progress of the disease, I became sure that it was a case of fungus ossium, I proposed amputation, but this not being submitted to, the patient continued to linger for about four years, when he died. The bulk of the limb was enormous, and the bony fungus which is pre-

served, although it has been macerated, and is now dry and shrunk, is still of amazing extent. The bone itself to which this morbid mass is attached appears elsewhere to be sound.

§ 22. It ought still to be mentioned, that when morbid dispositions of a peculiar or specific nature prevail throughout the body, producing tubercles, pulpy sarcoma, and melanosis, we find the same diseased actions even in the interior of bones, a proof that the organization and vital functions of bone resemble those of other parts of the body.

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## CHAP. XVII.

### *Diseases of Joints.*

§ 1. JOINTS are subject to inflammation, which may be produced by injuries or constitutional causes. In whatever structure of a joint inflammation begins, it is speedily communicated to the capsule, and to the synovial membrane, which being extended over the whole articular surface, the diseased action spreads along it till nearly every part is made to participate equally in the affection. The inflammation may vary considerably in degree.

The most simple and common effect of a slight degree of inflammation of a secreting organ, such as the synovial membrane, is an increase of its secretion, possessing qualities, however, which differ from those that characterize it when it is the product of ordinary and healthy actions. After a slight injury to the knee, therefore, in which the synovial membrane becomes affected, we find the capsule filled with fluid, and bulging out on either side and a little above the patella, in the situation where it is least bound down by the investing fascia. When the fluid thus effused into a joint is more aqueous than synovia, as is generally the case under the circumstances mentioned, the cartilaginous surfaces cling to each other and produce a kind of creaking noise when moved, which we should endeavour to distinguish from the grating, that is the effect of inequality in the opposing articular surfaces, and proceeds from irregular absorption either of the cartilages or bones.

The effect of a greater degree of inflammation of a joint than that which occasions an increased flow of altered synovia, is the thickening of the ligaments, and the deposition of gelatinous matter upon the surface of the synovial membrane. Into this gelatinous matter vessels may shoot, and, by organizing it,



produce a kind of vascular and sensitive fungus, which projects into the joint and impedes its movements, or which, by the injury that is done when motion is attempted, may prove a cause of irritation and continued diseased actions. The inflammatory actions may, indeed, be so aggravated in these cases as to occasion the effusion of pus into the joint. Though fungous growths are common in joints, yet I have not seen them produced from that portion of the synovial membrane which is reflected over the articular cartilages. When a vascular growth occupies this part of the joint, it would appear that the cartilage is removed, and that the growth takes place from the bone.

Inflammation of the synovial membrane covering the cartilage will be communicated to that structure and occasion its absorption, which may take place irregularly, producing inequality of surface, and causing a grating sensation when the joint is moved.

§ 2. Cartilage is a structure which does not seem capable of resisting morbid processes to any extent: inflammation would, in all probability, occasion its death, and to prevent this issue it is commonly absorbed at a very early stage of its diseases. Irritation affecting cartilage may, however, be continued to the bones, which, being thus excited, may produce vascular growths, such as have been described, or be irregularly absorbed, so as to present an inequality of surface, or, in fine, assume a diversity of diseased actions. It is in this manner that the diseases of joints are communicated to bones.

§ 3. In examining diseased joints we observe that the absorption of the cartilages may begin either on their outer or articular surface, which constitutes the joint, or on that which is applied to the extremities of the bones. In the latter case we see them detached from the bone, and reduced to very thin films, and the synovial membrane then participating in their disease, the joint becomes affected in its turn. It is thus that diseases of bone are communicated to joints.

§ 4. In the worst cases of diseased joints, where there is an irregularity of surface that is destructive to the natural functions of the part, we may still look forward with hope to a favourable termination; for the vascular growths that proceed from the different bones composing the articulation frequently coalesce, and produce a kind of ankylosis, in which event all inflammatory and morbid actions cease.

§ 5. While these morbid changes are going on in the interior of diseased joints, others are taking place externally. Glutinous matter is commonly deposited between the capsule and the fascia by which articulations are surrounded, with the effect of greatly enlarging their bulk. Sometimes a more serous and

even a puriform fluid is effused in the same situation. Such collections of fluid may escape by ulceration, without having any communication with the cavity of a joint, and the continued secretion from the ulcer which then takes place seems to relieve the disease of the articulation. I have known such collections of fluid evacuated by a puncture with apparent benefit; but I esteem the practice hazardous, for I have seen the capsule of the joint wounded in the operation. In this case pus was discharged in the first instance, and a considerable quantity of serous fluid evacuated afterwards. Besides, it often happens that the fluid that is felt beneath the fascia by which many joints are surrounded has escaped from the cavity of the joint, in consequence of ulceration of its capsule. When this occurrence happens, ulcerations of the fascia and skin frequently follow in different places, and apertures are then formed by which a probe may be passed into the interior of the joint.

§ 4. Mr. Brodie has lately described an affection of the synovial membrane, in which this part becomes thickened and intersected with bands, between whose interstices there is a brown-coloured substance deposited. In this state the membrane sometimes projects to such a degree into the articulation, when the knee is the joint affected, as to give it a globular appearance. Before the synovial membrane was recognised as a distinct structure, this projection would have been considered as a peculiar fungus. The disease seems to be of a specific and intractable nature; and the surface of the membrane still continuing to secrete, the growth is not likely to coalesce, nor the disease to be terminated by ankylosis.

§ 5. In diseases of joints the ligaments often become elongated, or destroyed by ulceration, so as to admit of a gradual displacement of the bones being brought about by the action of the muscles, or of external forces. In diseases of the knee we find the condyles of the femur jutting forwards beyond the articular surface of the tibia in consequence of the irritable action of the flexor muscles of the leg, or, when the patient attempts motion, the inner condyle projected to the inside of the top of the tibia, and towards the opposite limb. The ligaments of the hip-joint are often so completely destroyed as to admit of the thigh-bone being suddenly dislocated by the mere action of the muscles.\*

In advanced stages of diseases of joints, therefore, the ligaments being destroyed, and the muscles becoming irritable, we are to expect in a greater or less degree displacement of the

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\* Vide case in *Surgical Observations*, vol. i. p. 224.

bones, which then become modelled according to the new circumstances in which they are placed; and thus, though the disease terminate, the joint may become useless. Great attention ought, therefore, to be paid in such cases to the maintenance of the limb in a position in which it will subsequently be most useful.

§ 6. However complicated the disease of a joint may be, if the patient's health continue good, we ought not to despair. The new growth which is produced in the joint will form a bond of union, and acquire a ligamentous character; and thus a kind of *anchylosis* will take place, in which the joint will no longer possess its natural motions, but the limb may become very useful to the patient.

§ 7. Many diseases of joints are the result of disorder of the system at large; thus, acute rheumatism often occasions inflammation of a joint; and if it be the knee which is affected, the sudden filling of the capsule to a great extent is commonly soon evident. The relative temperature of the skin is increased in the neighbourhood of the joint thus affected. Great pain which remits occasionally, or occurs in paroxysms, generally accompanies the disease. When the rheumatic affection is of a less acute nature, however, the joint may fill with fluid without any great degree of pain being present or the surrounding skin showing any rise of temperature. Affections of joints of a rheumatic character fortunately do not generally produce those serious consequences which have been described as following ordinary inflammation.

Many diseases of joints caused and kept up by a disordered state of the general health occur, which although they resemble in some respects yet do not correspond in all particulars with our ideas and descriptions of rheumatic affections. They resemble these maladies, however, in this particular, that they do not injure the structures in the same manner as the diseased actions I have hitherto been considering. They, therefore, do not require the same strict confinement and attention to remedial means as the common affections of the joints.

### *Treatment.*

§ 8. When we consider the numerous and important evils which may arise from even trivial diseases of joints when neglected and badly treated, we must feel greatly interested in subduing them completely in the first instance, and in guarding against their recurrence. Nature has endowed the parts composing a joint with but little sensibility; yet when inflamed they become excessively sensitive and irritable: hence the necessity of avoiding all motion in cases of diseases of joints, more especially in those of a common inflammatory nature proceeding



from injury, and not constitutional causes; for if motion be permitted, all the symptoms are aggravated, or are re-induced after they have apparently subsided. An absolutely motionless state of the part is requisite, whilst all the measures which have been adverted to when speaking of local inflammation generally are here to be employed. We are to take blood from the part by leeches or cupping, and to regulate the temperature by evaporation.\* When the inflammation is subdued, the dispersion of the fluids and other matters which have been deposited in or around the joint during the continuance of the disease is to be attempted, and our measures now require to be of a stimulating nature. We employ stimulating embrocations of various kinds, blisters to the skin, frictions and pressure. Electricity is likewise occasionally employed. The application of camphorated mercurial ointment is also frequently resorted to.

The division of the treatment of diseases of joints into two stages appears to me very important. I remember a case in which the patient's sufferings and the disease were greatly aggravated by a blister applied before the inflammatory action had been quite subdued. When, at a later period, the inflammation had ceased, the same remedy appeared productive of the greatest benefit. A gentleman, whose constitution was disordered, and who had been labouring under an affection of the knee-joint, was sent into the country for the improvement of his general health, the knee seeming to require no farther surgical attention. Here he became feverish and indisposed from sitting up some nights successively, engaged in settling a series of mercantile accounts, and his knee again became painful. Conscientious of the great benefit he had formerly derived from a blister applied at a proper season, he now, of his own accord, put on another; but instead of relief, convulsions and spasms were excited in the muscles of the limb, the pain was greatly aggravated, and in the course of a few days the leg had become so much bent that the heel nearly touched the buttock.

We should be careful not to desist from the first part of the plan of treatment, or to allow the patient to move the joint till we find that slight motion can be borne without inconvenience.

Where we have reason to suspect that there is a rheumatic tendency in the constitution, we should not apply cold washes. We often see the detrimental effect of evaporating lotions continued too long, in cases of recent sprains, to which we apply a cold wash and a roller at first with the greatest benefit. The inflammation and swelling abate, and the tenderness is removed; but afterwards the patient becomes subject to pains of another description, and often more severe than those which were the

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\* Upon these subjects, vide chap. iv. § 3. chap. v. § 5.

primary consequence of the injury. Fomentations, and the bread-and-water poultice applied in bed, where the temperature is preserved, seem to be the best applications. They are soothing to the feelings, and induce gentle perspiration. The treatment, however, in my opinion, the most important of all, is that which is directed to allay or to remove that disorder of the system on which the local disease depends.

In treating diseases of joints connected with a disordered constitution, it is important, if we employ counter-irritation, that we advert to its effects on the system at large, and that we do not persevere in the measure if it operates injuriously. I knew a physician who had a diseased knee for several years, who could not bear the mildest excitement of this kind. He had submitted to friction in the manner Mr. Grosvenor recommended, which brought his knee into a very painful state, materially disturbing his general health. The only treatment admissible in this case was of the most soothing kind. Bread-and-water poultices, and perfect quietude in bed for six months, were required before any change could be permitted. He then ventured to move to a sofa during the day, his knee being steadied by splints. After some time he walked upon crutches, without bearing on the limb. In less than twelve months he walked with the aid of a crutch; in another year he could move about moderately well with the assistance of a stick; but he acted very guardedly, and it was long before he permitted himself to use the limb freely. He, however, at a later period, was enabled to take considerable exercise without the slightest inconvenience. The mildest form of counter-irritation that can be employed is the stimulating poultice. A poultice of vinegar and oatmeal will produce a pustular eruption resembling small-pox. But even this poultice could not be borne in the case last mentioned, so susceptible was the patient's constitution of disturbance by local irritation.

In chronic diseases of joints I have already said that it was of the first importance to maintain the constitution in a state of as much vigour and tranquillity as possible; and as bodily exercise is in many cases essential to this end, so I have often put the limb whose articulation was affected into splints, and thus enabled patients to walk about upon crutches without detriment to the local malady. This measure seems particularly applicable in those cases where the disease is in a tranquil state, and yet where a year or perhaps a longer interval must elapse before the limb can be useful to the patient. When the knee was the joint affected, after having by absolute rest and soothing measures subdued inflammation, and subsequently pursued other means as long as benefit seemed to be derived from their use, I

have then got the limb into as good a position as possible, and in the following manner procured a model for proper splints to steady the articulation :—Having some pieces of thick pasteboard, two or three inches broad, and long enough to reach about three inches above and below the joint, I soak them in water and apply them on either side, binding them on gently, but accurately, with a calico roller. When the splints of pasteboard have become dry, they are to be removed, and will be found to have the form of the surface to which they were applied. From these pasteboard splints wooden ones may be fashioned. One of them should have a leather strap fastened to it at the distance of about an inch and a half from either extremity, and the other should be provided with a couple of pegs or buckles in corresponding situations. The splints are then to be padded with flannel, in the manner I have recommended when speaking of fractures,\* applied and secured to the thigh and leg, above and below the joint, by means of the leather straps. In steadying the ankle-joint I have found one splint sufficient. It should ascend three or four inches above the level of the articulation, and reach to within half an inch of the sole of the foot; from this part it should be continued at a right angle, along the side of the foot to the end of the metatarsus, in order to prevent lateral motion.

When joints become diseased in consequence of the bones having been primarily affected, after a tranquil state has been induced by proper measures, an issue seems in general to be the most efficacious means of keeping the original malady in an inactive state; and this being effected, we must then await the gradual subsidence of the disease in the bone, and the recurrence of healthy actions for the reparation of the injury the joint has sustained.

When diseased joints have recovered, there may still remain a great degree of thickening in the surrounding parts, and in consequence of this the motions may be very limited. In such cases hand-rubbing and gentle motion seem to be very efficacious in dispersing the enlargement, and in giving pliancy to the articulation. Care must be taken that these measures are not adopted at too early a period, and that the diseased actions are at no time resuscitated by their continued employment. I have also found Mr. Baynton's bandage of sticking-plaster useful in cases of the kind now under consideration. As I have already spoken of the great utility both of friction and pressure, in Chap. V. when treating of Chronic Inflammation, I shall only add, that in the case of diseased joints gentle pressure is

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\* Chap. xix. § 5.



further beneficial by steadying and preventing the motion of the articular surfaces upon each other.

The object of treatment in those diseases of the joints, which evidently arise from constitutional causes, is to sooth the local malady, and to tranquillize and improve the state of the general health. In my *Surgical Observations* I have related in contrast two cases of disease,—the one in a more purely local form, the other the result of a more general or constitutional affection, occurring in the joint of the hip.\* In farther evidence I will at present briefly recite the circumstances of a case of constitutional disturbance producing an affection of the joint of the knee. A young lady whom I had formerly attended for stricture of the œsophagus which was supposed to require the introduction of bougies, but which was entirely owing to an unhealthy condition of the stomach and alimentary organs, consulted me about a greatly enlarged and very painful state of her knee, the consequence, as she said, of a sprain: her tongue was extremely furred, and the actions and discharges of her bowels very faulty. I recommended her to lie in bed, to apply a bread-and-water poultice to her knee, to regulate her diet, and to take such medicines as were likely to improve the state of the alimentary organs. Several days and nights passed over, during which, especially the nights, she suffered extreme pain, without any change in the state of her general affection or local disease. She now consulted physicians, and was very urgent for the application of blisters and leeches, to which I told her I would not consent till her tongue became clean. Three weeks elapsed before this favourable change took place, when it happened suddenly, and she as suddenly lost all pain, was able to get out of bed, and soon recovered the use of her limb.

#### *Moveable Substances within the Joints.*

§ 9. Joints are liable to have excrescences formed on the surface of their capsules, which acquire a cartilaginous, and, in some cases, an osseous structure. These moveable substances seem to be occasioned by small masses of gelatinous substance being all but completely detached from the surfaces on which they had been deposited. Still adhering by a slender pedicle, they are penetrated by vessels, organized into pendulous growths, and being subsequently broken off from their connexions, move about in the joint like foreign bodies, and keep up a state of irritation. It is in the knee-joint that such bodies are most frequently met with. I saw a case in which I feel assured there were more than 100 of these bodies.†

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\* Vide *Surgical Observations*, vol. i. p. 224.

† Vide *Surgical Observations*, vol. ii. p. 219.

When there is one or two of these bodies, which slide about, and get between the bones, or interfere with the crucial ligaments, they prevent the patient from walking, and produce considerable irritation in the joint, so that it becomes necessary either to prevent them from shifting in this manner, or to remove them from the joint by an operation. As the operation is of rather a serious nature, Mr. Hey of Leeds has suggested the possibility of keeping them fixed in one situation by means of a bandage, which presses the patella and sinews attached to it firmly against the surface of the joint on which they move. By this means the loose body or bodies may often be maintained on that side of the joint where they happen to be lodged; the expedient, however, will not succeed in all cases. Having discussed this subject in my *Surgical Observations*, vol. ii. p. 219., I need not enlarge upon it here.

### *Hydrops Articulæ.*

§ 10. Joints are liable to a dropsical effusion into their cavity, by which is meant the pouring out of a fluid from the surface of the capsule without any inflammatory action. It is in the knee-joint that we are able to detect this kind of disease; for there, in consequence of the looseness of the capsule, it often proceeds to a very remarkable extent, without any material injury resulting to the articular surfaces. By slow degrees the capsule has in some cases been so distended as to reach half way up the thigh. Cases of this description often get well by attention to the state of the general health, with alterative doses of mercury internally, and embrocations of spirits, vinegar and water, and the application of a calico roller to the parts affected. If this treatment does not succeed, rest and blisters will commonly be found to disperse the fluid, although the collection sometimes again takes place, from the morbid propensity continuing which gave rise to it in the first instance.

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## CHAP. XVIII.

### *Of Diseases induced by extraneous Causes.*

THESE diseases may be divided into such as are the result of mechanical injury, of chemical agency, and of the noxious or poisonous qualities of various combinations of matter, which may, therefore, be denominated *morbific*.

### 1. *Of Mechanical Injuries.*

§ 1. When violence is done to any part of the body, the injury is generally of a complex nature, which will be best understood by considering each variety of mechanical injury in its simple and uncombined state.

1. *Concussion*.—When the brain is concussed, the functions of the organ become for a time greatly impaired, nay, almost suspended. On recovery from the first shock, they are carried on in an irregular manner, and inflammation succeeds to this, as to other mechanical injuries, in proportion to the violence inflicted. A bone may be jarred, and yet not broken. Inflammation and subsequent suppuration may take place in its medullary structure. This happens in the cranium; and a case is recorded of the same occurrence in the upper part of the tibia, by Mr. Dease of Dublin, who, having watched the progress of the case, felt assured of its nature, trephined the top of the tibia, and gave discharge to the matter.

2. *Spraining*.—A force which tends to stretch the fibres of any part of the body beyond their natural length impairs their functions, and is succeeded by a degree of inflammation in proportion to the injury sustained. In violent sprains blood-vessels may be ruptured and their contents effused, as happens in the next form of mechanical injury.

3. *Contusion*.—A forcible though very transitory compression of the fibres of parts is very injurious, and may even cause them suddenly to perish. In a less degree it is succeeded by inflammation, which may, in conjunction with the injury, also occasion sloughing. The inflammation, when more moderate, causes suppuration or ulceration, and when trifling, it may gradually subside in resolution.

In contusions, the small blood-vessels of parts are often ruptured, and blood is effused into the connecting cellular tissue so as to produce discoloration and swelling. This circumstance is what chiefly attracts the attention of common observers. The effusion seems to be greatly augmented by the inflammatory action of the vessels consequent to the injury, and it may be checked by means which repress any increase in the temperature of the part, and have a tendency to moderate or prevent inflammation. Much of the effusion into bruised parts also takes place, probably, in consequence of excited action without any rupture of vessels; for persons of lax fibre are bruised by the slightest touch, such as appears inadequate to rupture the most delicate vessel. When vessels of a larger size happen to be ruptured in bruises, the effused blood is often infiltrated through the cellular substance to a great extent; it is also fre-



quently collected in a mass in the circumference of the bleeding vessels, where it generally coagulates and makes a firm swelling. Sometimes, however, the blood effused remains in a grumous or semi-fluid state, or after having coagulated, it seems again to become fluid. In some cases, under these circumstances, inflammation and suppuration take place, and the collection may require to be evacuated. This, however, is a rare occurrence; for if bruised parts are kept quiet, and inflammation be obviated, the effused blood, whether in a fluid or solid state, is gradually absorbed, and the parts undergo those changes in colour which are too well known to require description.

§ 2. In all these injuries we should keep the parts which have suffered motionless, and prevent, as much as possible, the inflammatory action which is the natural consequence of the violence done to them. When sloughing occurs in bruises, the part cannot heal till the slough is detached; and as the surrounding parts are weakened in consequence of increased action, the ulcer that results is slow in healing. All of these circumstances are exemplified in bruises of the shin, which are popularly known to be very slow in recovering.

### *Of Wounds.*

The foregoing analysis of the various effects of mechanical violence will enable us better to understand the nature of wounds, and to predict their consequences.

§ 3. Wounds are defined to be breaches in the continuity of the fibres of parts, occasioned by mechanical means.

In *simple incised wounds*, the cohesion of fibres is destroyed by means of straining and contusion; but these are so slight in degree, that they are not even followed, in many cases, by inflammation. Probably a lax state of the divided fibres contributes to mitigate the consequences of the injury.

In *contused wounds*, the division is effected by pressure acting in a direction perpendicular to the fibres divided.

In *lacerated wounds*, the fibres are broken by straining; the force acting in a horizontal direction.

In cases where much contusion or laceration is inflicted, the edges of the wound are not likely to unite by adhesion; on the contrary, they are apt to slough, and, at all events, they only heal by a granulating process.

In *punctured wounds*, there is both contusion and straining of the fibres before they give way. The degree of bruising and stretching is slight in proportion as the instrument by which the wound is inflicted is pointed and slender; so that even wounds of this description may unite by adhesion.

§ 4. The objects to be aimed at in the treatment of wounds are, to re-apply the divided fibres to one another, to preserve them in a motionless and relaxed state, and to prevent or mitigate inflammation. In simple incised wounds, where the straining and contusion have been in the least possible degree, so as not necessarily to be followed by inflammation, if means be properly adapted to the ends just mentioned, the parts will become glued together, either by a very thin layer of effused blood or glutinous matter; new blood-vessels and nerves will shoot through this agglutinating medium, and convert it into an organized and living part. The newly-formed vessels are at first very tender, and scarcely contain red blood, they are easily lacerable, and I have seen the entire uniting medium torn asunder in rudely removing dressings. The vessels become firmer and larger by degrees, and those from the opposite sides of the wound have been observed to coalesce. The medium of union between wounded surfaces is probably afterwards absorbed in a great degree, in the same way as the granulations of ulcers are removed. (Chap. XII. § 3.) Indeed, we see that parts which are united, though perhaps not closely, are, if left undisturbed, gradually approximated by this process of absorption. Finally, the uniting medium acquires in a great measure the properties of the parts it conjoins. Thus, when interposed between tendons and ligaments, it becomes a strong, inelastic, and little sensible substance, and between bone and bone, it acquires an osseous structure and hardness. Where the process of adhesion is carried on without obvious inflammation, it is generally completed in about 60 hours, though, as has been said, the union is still of very delicate texture.

§ 5. When an injury has been such as to induce inflammation which terminates in secretion from the wounded parts about the third day, the process of union by immediate adhesion is defeated, and the sides of the wound are then conjoined, in the same way as the chasms of ulcers are filled up — by the growth of granulations. When there has been so much contusion or straining as to occasion the death of the surface of the wound, the dead parts must be thrown off before the breach can be repaired by granulations.

The union of parts by either of these processes is the same in effect—they are united by a new living substance, which afterwards acquires the properties of the structures it conjoins. In whatever manner it seems likely that wounds will unite, it is the duty of the surgeon to approximate the divided parts, and to maintain them as nearly as possible in their natural position; for in this way the quantity of new growth necessary to complete the union will be diminished, and the cure expedited.

§ 6. When flaps of skin and other soft parts are torn away so as to be even very partially attached, they should, nevertheless, be replaced, and properly secured in their natural situation. The experiments of Taliacotius, which of late years have been repeated, of making artificial noses and under-lips by reflecting portions of skin from the forehead and beneath the jaw, to unite them with the integuments of the face, and likewise the experiments of Mr. Hunter\* upon this subject, show that very low degrees of vitality will enable parts to unite and regain their ordinary degree of living power, when placed in contact with healthy structures.

§ 7. In closing wounds with the views already stated, (§ 4.) the position of the patient is the first thing which engages our attention. The position should be such as closes or tends to close the wound, and which can be continued for any length of time without inconvenience. If the integuments on the front of the thigh are divided in a transverse direction, and the leg is bent on the thigh, it is evident that the wound will be made to gape, and it will be impossible to approximate its edges; whilst in the contrary position it may be closed completely, and the contiguous skin will even be quite loose. Should such a wound

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\* Mr. Hunter first transplanted the tooth of a dog into the comb of a cock, where it became firmly fixed. After some time he injected the head of the bird with fine injection, and found that the comb not only firmly adhered to the fang of the tooth as the gum does, but that a vascular growth had shot up the cavity of the fang into the interior of the body of the tooth. He next transplanted the testis of a cock into the body of a hen, placing it between the peritoneum and parietes of the abdomen, where it became attached. When he afterwards injected the vessels of the bird with fine injection, he found that a very vascular substance had united the testis to the contiguous parts. Doubtless Mr. Hunter thought that the testis was a living part, though there is no evidence of its having been injected. His opinion on this point may be inferred from his belief that living parts have an antipathy to the contact of those that are dead; for thus does he account for the inflammation that takes place in the circumference of sloughs, as if with a view to throw them off. As a further proof, he refers to the instance of the Guinea-worm, which when alive may be traced from the upper part of the thigh to the ankle, without any inflammation occurring in its circumference. When inflammation and ulceration take place about the ankle, so that the end of the worm is visible, the sailors tie a piece of strong silk round it, which they afterwards attach to a small slip of wood, straw, or card, and then draw out as much of the worm in a coil as can be extracted without stretching it. This operation is repeated daily, till the whole worm is extracted; but if from hurry they break the worm, and it perishes, inflammation and abscess then occur in different places throughout the tract of the limb in which the worm lies embedded. Yet as these experiments of Mr. Hunter afforded no absolute proof of the transplanted parts possessing life, he next transposed the spurs of a young hen, and set them in the legs of a cock; and in this case they grew to a much greater extent than they would have done on the limb of the parent animal. The preparations demonstrative of the foregoing facts are to be seen in the Hunterian Collection, at the Royal College of Surgeons.



have penetrated deeply, and divided the extensor muscles of the leg, the gap will be increased by the contractile power which the divided fibres possess ; and there is no way of bringing the sides of such a cut together but by lessening in the greatest degree possible the distance between the several attachments of the divided muscles. When parts can be brought into contact by position, a few straps of sticking-plaster will suffice to retain them in exact contact. It is, however, wrong to drag parts together, even by straps of sticking-plaster, or to force them into contact by means of bandages ; for the irritation such treatment produces in the injured parts will bring on inflammation and retard the healing of the wound.

In cases of badly contused wound, parts that are injured beyond a certain degree will perish, the rest will inflame ; and it is to this inflammation that we are to attend. How much a loose and motionless state of injured parts contributes to the mitigation of inflammatory action need not here be insisted on.

Sutures were formerly much employed in bringing together the edges of wounds ; but if, by position, we can place parts in easy and exact contact, so that a few strips of sticking-plaster shall keep them motionless, it must be wrong to pierce the skin and flesh in many places with needles, and still more injurious to leave so many foreign bodies or threads, as certain sources of irritation, where our principal object is to prevent or mitigate inflammation. Again, if we cannot accomplish the closure of the wound by gentle measures, it must be still more absurd to think of drawing sensitive parts together, and keeping them on the stretch by means so highly irritating as sutures. Sutures ought never to be employed but in cases where sticking plaster cannot well be applied, and where the parts are particularly lax, as in the scrotum, or for the purpose of insuring the quiescence of the patient, by making the least motion painful to him. The suture in the hare-lip has this effect upon a child, who controls a disposition either to laugh or cry, because he is aware that motion would be productive of pain.

§ 8. The inflammation which occurs after injuries will, doubtless, vary according to the degree of the injury, and the state of the constitution of the patient ; yet it is generally of a healthy character, and is most relieved by means which regulate temperature. When these are properly employed, and the parts which have suffered are kept in a relaxed and quiet state, surgeons often perceive with surprise the little inflammation that succeeds to injuries. This surprise ought to be lessened, however, when it is remembered that injuries differ in their circumstances from diseased actions in one essential particular, viz. that they occur in parts which are healthy. Parts which are

greatly injured inflame or perish, but the contiguous structures are sound, and are excited only by sympathy with those that have suffered. The utility of evaporation in regulating temperature is in general so great in cases of injury, that with a view to prevent the moisture from loosening the strips of sticking-plaster, I very regularly adopt the expedient suggested in my *Surgical Observations*, of varnishing them with a solution of sealing-wax in alcohol.\* This allows of washes being applied, without detriment to the best means we possess of retaining the sides of a wound in close contact.

Sometimes it is necessary to apply poultices to injured parts ; but as the reasons which guide us in making applications of this nature have been already explained, when treating of inflammation in general, (Chap. IV. § 4.) it is not necessary to repeat them.

§ 9. As the degree and kind of inflammation occurring in consequence of injuries greatly depend upon the state of the constitution, so it is of consequence to endeavour to tranquilize any disturbance of the system which an injury may occasion. On this account quietude, with strict attention to the various functions, (especially of the alimentary organs,) are measures of much importance.

§ 10. In performing operations, surgeons make wounds which it is afterwards their object to heal ; and it seems right to say a few words on this subject, in order to exemplify the powers of nature in the cure of simple incised wounds. In my opinion all wounds should be treated alike ; and I think it wrong to dress and bandage up the wounds made in operations, and then move the patient into bed ; for by this, parts which have been put together are separated, and the plasters which gave support are loosened in some degree and put awry, or the position of the wounded parts being greatly changed, the straps no longer give the kind of support that is required. It is better, after having secured every vessel likely to bleed, to bring the wound together by two or three strips of sticking-plaster, and to put the patient to bed, there to let him take an easy and suitable position in which he can remain for a great length of time, and then accurately and gently to complete the apposition of the sides of the wound. It is improper to close such wounds throughout their whole extent ; for if, in consequence of the inflammatory actions which succeed the injury, but a little blood exudes into the wound, it will prevent adhesion, moreover, it will prove a source of irritation, and keep up inflammatory action. If it cannot

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\* Vide *Surg. Obs.* vol. i. p. 228.

escape, it distends the wound, and brings on violent hemorrhage from vessels too small to require a ligature, and which cease to bleed the moment they are exposed to the air. As the hemorrhage, however, is the consequence of the reaction of the injured vessels, so it is not likely to continue beyond six or eight hours, and then those parts of the wound which have been left open for discharge may be closed by sticking-plaster.

As the regulation of temperature is our chief means of repressing the inflammatory action consequent to injuries, wounds should be left exposed, or very lightly covered. I am in the habit of removing even the bed-clothes from off the wounded part, and directing an attendant to moisten its surface frequently with water, and to wipe away or gently to press out with a wet sponge any blood that may seem about to ooze from the spaces which are left uncovered. Under this management I have repeatedly seen extensive wounds made for the removal of tumours unite by adhesion, within 60 hours. In one case where the wound was more than nine inches long, it healed in the time just mentioned, so as to have the appearance of a superficial scratch, with a slight incrustation of blood upon it. I have also seen the large wound made by the amputation of the thigh above the knee unite by adhesion in every point except where the ligatures were interposed. Such an occurrence must be very rare, for the patient's health in cases of amputation is not generally favourable to adhesion.

§ 11. Of late, at Vienna, a mode of treating wounds has been adopted, which, so far as I have had an opportunity of observing its effects, deserves imitation. The wounded surface is left exposed for some time to the air, and bathed with water until it appears covered over with a glutinous deposition, which is seen to ooze out in distinct and separate masses, till at last the whole surface is glazed or covered with a kind of glue. When this has happened, there is no chance of hemorrhage occurring, and the sides are brought gently into apposition, and thus become agglutinated. This seems to me an excellent mode of accomplishing the union by the first intention.

§ 12. An ingenious and very successful mode of closing and procuring the adhesion of penetrating wounds was discovered in France by persons who were not aware of what they were effecting. The *secret* method of treatment, as it was called, consisted in sucking the blood from these wounds at either extremity, and thus causing their sides to be pressed into close contact by the weight of the atmosphere. Under this treatment wounds, made by the thrust of a small-sword, which traversed limbs, and even the cavity of the abdomen, have been known to unite by adhesion without the occurrence of inflammation.



*Of Hemorrhage from Wounds.*

§ 13. If wounds be so deep as to endanger the principal arteries of limbs, whilst their superficial extent is so small as to prevent the inspection of their bottom, we may gain some information by examining the pulsation of the branches which proceed from the vessel we suspect to be injured. For instance, a woman received a transverse wound across the upper part of the inside of the arm, which penetrated very deeply. She bled profusely, but fainting, all hemorrhage ceased. In this condition she was brought to an hospital, when the surgeon, not feeling any pulse at the wrist, immediately enlarged the wound, and discovered that the brachial artery had been divided. Both ends of the vessel being secured by a ligature, the wound was closed, and the patient did well.

It is necessary to tie both ends of a divided artery, and when there is great freedom of communication, the artery must be tied where the wound is inflicted. A patient had the ulnar artery divided, the hemorrhage ceased, and the wound was closed. After four or five days, hemorrhage recurred, and there was considerable effusion of blood into the cellular tissue, producing a deformity and discoloration of the limb. Under these circumstances, the surgeon tied the brachial artery at the bend of the elbow, and all hemorrhage ceased for nearly a week, when it was again renewed, probably from the lower end of the divided artery, which obliged the surgeon in conclusion to tie the artery where the wound had been inflicted.

In the mode of treating wounds adopted at Vienna, which has been described, it is scarcely deemed necessary to tie any but the principal arteries of limbs. Yet as it seems proper to tie every vessel likely to bleed, and it is difficult to distinguish them when the patient is faint, we may be directed in our search by passing the finger lightly over every point of the wounded surface; for the arteries which will be likely to bleed have a firmness that renders them distinguishable by such an examination, and we are then enabled by sponging and careful inspection to see and to tie them. If a surgeon leaves the principal artery untied, the life of his patient is in continual danger. The renewal of hemorrhage is the consequence of inflammatory action in the wounded parts. The first gush of blood is attended with the relief of uneasy feelings in the part, and is therefore, scarcely observed by the patient, who may suddenly grow faint, and become unable to call for help, so that when next looked to by his attendant, he appears dead, or so sunk that he does not long survive.

By the same mode of proceeding, that is, by our sense of

feeling rather than of sight, we are enabled to secure arteries in deep-seated wounds without enlarging them to that extent which would be necessary to inspect their deepest parts. This could not in many cases be effected without considerable mutilation, and greatly augmenting the extent of wounds. By putting in the finger, and feeling, we may press upon the bleeding vessel and check the further escape of the blood. We may then sponge the bottom of the wound, and ascertain by degrees the firm projecting extremity of the vessel, and even feel the course of the tube to a small extent. Its firmness and cylindrical form, even if it is not bleeding at the time when we are examining it, distinguish it from any other substance except a nerve; and we are assured that it is not a nerve, because no pain results from nipping it or slightly pulling at it. Having got the vessel between the tip of the fore-finger and thumb of the left hand, we take a silver needle with a steel point, which we slide down the nail of the thumb till it arrives at the nail of the finger, and then carry it along the nail of the finger till the point can be felt at the bottom of the wound. We can take hold of this point with a pair of forceps and draw it forward, moulding the shank of the needle so as to allow it to conform to the shape of the track which it is to take; and thus, as we draw the needle out of the wound, we pass a ligature round the cord-like substance which is included between the tips of the finger and thumb. A noose must now be formed by an assistant, and drawn tight, till the surgeon feels assured that the knot is secure behind the part which he has between his fingers. By this mode of proceeding I have tied many vessels in deep-seated wounds without enlarging them. I shall only relate one instance.—A lady ran a sharp-pointed knife into the outside of her hand, through that mass of muscles which is extended from the carpus to the little finger. It penetrated horizontally into the hand to the depth of  $2\frac{1}{2}$  inches at the deepest part of the cut, and the wound was continued from the bottom of the little finger to the wrist. She bled very profusely, and the tourniquet was applied. Wiping out the wound with a small piece of sponge, introducing my finger, and loosening the tourniquet, I ascertained that the blood flowed from two different sources, one of which I could compress with the point of my finger: this was in that part of the wound near the distal end of the metacarpal bones. By the proceeding already mentioned, I became assured that I had hold of the artery and could pass a thread round it. This being done, and the tourniquet being slackened, it was made evident that a much larger vessel was bleeding in that part of the wound next the wrist, which was felt and secured at once by the same mode of proceeding.

Yet wounds may bleed though the vessels are not of such magnitude as to admit of the foregoing treatment; and for these, surgeons have been much in the habit of employing styptics. Styptics can only act by inducing contraction in the orifice of the bleeding vessels, or by coagulating the blood in them; whilst by exciting inflammatory action they are apt to produce hemorrhage. Of this I will relate an instance or two. A man cut his hand in a semicircular manner near the wrist, traversing the course which the ulnar artery takes to form the arcus superficialis. Some styptic was employed, and the man was brought to the hospital with his hand tightly bandaged. As all hemorrhage was suppressed, the house-surgeon did not undo the wound for some days, and when it was dressed, it was done superficially. The hand was swollen and heated, and after a time hemorrhage again occurred. Pressure was now made upon the ulnar artery above the wrist. This suppressed the hemorrhage for a time; it was, however, renewed in the course of two or three days. When it came on, the bleeding was exceedingly profuse; but as no vessel could be discovered from which the blood issued upon separating the edges of the wound, it was dressed to the bottom with dry lint, and the pressure on the ulnar artery was continued. Styptics were afterwards resorted to; but all these measures seemed to augment rather than to control the disposition to hemorrhage, which recurred after intervals of two or three days, and was more and more profuse at every renewal. Three weeks had elapsed in this manner, and one of the dressers assured me that the blood had actually sprung up in his face on the preceding evening when he was removing the dressings. Not doubting that the ulnar artery had been wounded, I enlarged the wound and reflected back the skin to a small extent, when I saw that the palmar fascia had not even been divided. I then directed that the man's hand should be laid upon a pillow out of bed, that the wound should be dressed with simple salve, and evaporating washes applied. From this time no hemorrhage occurred, nor was there any inflammation; the wound granulated, and healed in the ordinary manner.

A maid servant received a cut in the course of the ulnar artery, at about that part of the arm where it emerges from beneath some of the flexor muscles to continue its course in the direction of the ulna. She bled so profusely as to faint, and then all hemorrhage ceased; after some days a considerable hemorrhage again took place, but stopped spontaneously. She refused to let the surgeon enlarge the wound, and he applied styptics and pressure, which occasioned inflammation and thickening of the parts, but did not prevent, nay, on the contrary.



probably rather promoted hemorrhage. As she was much reduced by loss of blood, he sent to me ; but she refused to allow me to enlarge the wound, which was necessary to secure the bleeding vessel. As her determination was unalterable, I recommended that she should lie with her arm out of bed, the wound covered with simple salve, that evaporating lotions should be applied, and that the tourniquet should be loosely fastened round the arm, leaving directions to those who attended her to tighten it, should hemorrhage take place, observing that it would then become our duty to enlarge the wound, even against her inclination. But no hemorrhage afterwards ensued, the inflammation and tumefaction of the wound subsided, and it healed. There is abundant evidence to induce us to believe that very large arteries, having been divided, and ceasing to bleed from faintness, will not bleed again unless inflammatory action be induced. The exposure of the wounded part to the air, and the cooling of the surrounding skin by evaporation, have appeared to me the most efficient means of suppressing hemorrhage. In this way I have known the most alarming cases of hemorrhage from the rectum and vagina controlled. In cases where I could employ the expedient of putting a dossil of lint to the bleeding part, holding it in contact with the surface to which it was applied, I have found it to be a very effectual means of stopping hemorrhages, provided the surrounding parts are cooled by evaporation. People will even suffer leech bites to bleed to an injurious extent, without having the sense to adopt this simple means of suppressing hemorrhage, which it is in every person's power to apply. Wipe the blood quickly and completely from the surface from which it issues, lay upon it a dossil of lint, and press that lint with the point of your finger, and no more hemorrhage can take place. Having waited for a few minutes, you perceive that your finger becomes agglutinated to the lint, which shows that the lint is in like degree glued to the surface to which it has been applied. The finger should now be moved a little, so as to prevent any firm cohesion of it ; but the pressure is still to be continued. After a time the finger may be removed, when the agglutination of the lint will be sufficient to prevent hemorrhage, especially if inflammatory action be suppressed by producing evaporation from the surrounding parts. I removed a pendulous tumour of considerable magnitude from the vagina of a lady. The pedicle was not large, nor situated far within the orifice of the canal. The vessel which supplied the tumour bled in a furious manner, and seemed to be of considerable magnitude. The patient would not allow me to take hold of it with a pair of forceps, which I could have done ; so that I was obliged to have recourse to the foregoing expe-

dient, which answered the purpose completely,—the hemorrhage being immediately suppressed, and not afterwards renewed. All hemorrhages from wounds seem to result from an action of vessels of the inflammatory character, which stimulants are calculated to maintain. The distension of wounds by lint or other substances which entangle the blood, and thereby promote its coagulation, is a procedure likely to keep up inflammatory action, and I have known a great number of instances of hemorrhage being kept up by the very means which were used to suppress it.

### *Gun-shot Wounds.*

§ 14. If such a substance as a bullet be impelled through any part of the body, we do not hesitate to admit that the wound must be inflicted with great contusion and straining of the parts prior to their giving way, and we are therefore naturally led to anticipate the circumstances which usually occur in cases of gun-shot wounds. There is commonly a considerable ecchymosis about the orifice of the wound and around the track of the ball, producing sudden and considerable swelling, which is subsequently augmented by inflammation. The surface of the wound, we conceive, will perish and exfoliate, and we consequently look for the great discharge of matter and sloughs which generally occurs from one or both of the apertures made by the ball; and we are not surprised, when we reflect in how great a degree the actions of the injured and contiguous parts must have been excited, that the fistulous tracks of bullets should be so commonly slow in healing. We cannot wonder, then, at all the consequences we often see, whilst we must feel surprise that the passage of a bullet is sometimes attended with a far less degree either of local or general disturbance than could in reason have been anticipated.

§ 15. Gun-shot wounds, though scarcely any pain is felt at the moment of their infliction, are often attended by a great degree of mental, and, if I may use the expression, of bodily alarm. The patient is cold and faint, agitated and powerless.

§ 16. As bodies in rapid motion are susceptible of reflection from their course by trivial obstacles, and as the angle of reflection is equal to that of incidence, so we cannot know the course which balls have taken when they pass through the body, nor predicate where they may be lodged when they have only penetrated its substance. Nothing can display this part of the subject more clearly than those cases where the orifices made by the entrance and exit of a bullet are diametrically opposite in the body or head, and yet where neither the cavity of the thorax nor cranium has been penetrated. I remember the case of

a man who attempted suicide by firing a pistol against his temple just above the zygoma. Doubtless he had depressed the butt end at the moment of firing, and the ball impinging at an obtuse angle against the fascia of the temporal muscle was reflected at an equal angle against the scalp, and so on successively, till it came out at the opposite zygoma, having passed in the loose cellular substance between the cranium and the aponeurosis of the occipito-frontalis muscle. The absence of serious symptoms, and the subcutaneous inflammation which speedily appears in the track of the ball, sufficiently explain the nature of such cases to the practitioner. As parts injured by the transit of a bullet may slough, or become diseased, and as we know not what course the ball may have taken, so we never can with certainty predict the issue of a gun-shot wound. A large artery or the bowels may have been injured, and may, by sloughing or ulcerating, pour out their contents at a time remote from the receipt of the injury and when the patient was thought to be nearly well. Mr. Hunter relates the case of a man on board ship who had been shot through the thigh, but who seemed to be fast recovering, for the inflammatory action had subsided and the wound was healing. Between a fortnight and three weeks after the receipt of the injury, however, the man was found dead in his hammock, and his limb surrounded with blood. On examining the limb, it was ascertained that the femoral artery, having been grazed by the bullet, had sloughed, and given occasion to the hemorrhage, which had proved fatal. In the same manner it has happened when a ball has passed through the abdomen, that some part of the stomach or intestinal canal has sloughed after a considerable lapse of time, and thereby given an outlet to its contents. In cases of this description, the matters effused are not found to spread through the cavity of the abdomen and among the viscera generally. They are circumscribed by the adhesive inflammation which had previously occurred, round the track of the bullet, and they then present themselves as a kind of abscess at the surface, and either escape by an ulcerated opening or are extracted by the surgeon. A number of these cases are recorded in the *Mémoires de l'Académie Royale de Chirurgie*, under the title of *Epanchemens des Matières alimentaires*. There is one, in the person of an old soldier, which forms a very striking illustration of the circumstances connected with these cases. This man had been shot through the belly, the stomach was the organ which was injured, and subsequently sloughed. The matters effused did not present opposite the seat of injury, but crossing the abdomen obliquely downwards, were afterwards discharged near the right groin. The patient recovered from the immediate



ill consequences of the injury, and a fistulous track between the viscus wounded and the groin was all that at length remained. On drinking copiously, the fluid passed through the opening in the stomach, and escaped by the aperture in the groin, into which the man had fitted a stop-cock; and he used to gain a livelihood by drinking wine and other liquors, and drawing them off by means of his contrivance, for the amusement of the spectators.

Persons have also been frequently killed by spent balls, though no external marks of injury have appeared. On examining the bodies of those who have fallen in this way, however, serious injury is often found to have been done to the viscera and other internal parts.

### *Treatment of Gun-shot Wounds.*

§ 17. As a copious discharge and sloughing are looked for from the tracks of balls, it was formerly the custom to enlarge the orifices made by the entrance and exit of the shot, with a view to facilitate the escape of matter, sloughs, &c. This practice is now discontinued, nor does it seem necessary.

If the ball or any of the wadding, or some piece of the clothes, can be readily felt, it may be proper to enlarge the wound for the purpose of extracting it; but when the foreign body cannot be felt, it is wrong, by the introduction of instruments, to increase the injury by searching; for we cannot, as has been already said, be certain of the direction which a ball has taken, nor can we ever predict where it may lie concealed. An officer of distinction received a ball in his hip, and the desire to effect its extraction induced the surgeons to enlarge the wound and to search for it; but in vain,—the ball could not be discovered. The patient was an elderly man, and the accident occurred in a very hot climate. The wound went on unfavourably, and the patient died. Upon examining the body after death, the ball was found lodged in the trochanter major, and so firmly embedded in its substance, that it could not be got out without employing a trephine. All the injury which was done in this case, therefore, was the bursting through the skin and fascia of the thigh, and the comminution of a certain portion of the spongy structure of the bony process mentioned; and it seems probable that the result might have been different had the search that was instituted for the bullet never been made.

When a ball, or other foreign body, is beyond our reach, it may lodge in a quiescent state, the surrounding parts becoming condensed by adhesive inflammation, and it may afterwards gradually make its way to the surface. The mode in which foreign bodies advance has been already explained. (Chap. XII.

§ 2.) No inflammation marks their progress; and it is only when they arrive beneath the skin that the formation of an abscess warns the patient that they are about to be discharged.

A surgeon was shot in the thigh with a ball from a horse-pistol. The track of the ball ascended obliquely towards the top and outer part of the thigh-bone, and for a considerable interval a long probe could be passed to its extremity without meeting any obstruction. After about three weeks, when the inflammation and swelling had subsided, and the quantity of discharge from the wound was inconsiderable, he began to complain of a pain at the inner ham-string; he also said he felt something hard there, and requested me to examine the place; I did so, and felt a hard body presenting a semicircular edge to the skin. Inflammation and ulceration supervened, and the bullet, flattened like a halfpenny, was discharged.

As to the treatment of the inflammatory symptoms that follow a recent gun-shot wound, it differs in nothing from what has already been said in reference to inflammation generally. The injured parts are to be kept in a lax and motionless state, the temperature is to be regulated, and poultices are to be applied.

Wounds that penetrate or pass through the lungs often rupture large vessels, and are attended with circumstances requiring explanation. Blood is then not only coughed up, but flows into the cavity of the chest, and as it accumulates there, it compresses the lungs, arrests the hemorrhage, and may for a time preserve the life of the patient, which, nevertheless, may subsequently be lost in consequence of the putrefaction of the blood effused in the cavity of the chest.\*

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## CHAP. XIX.

### *On Fractures.*

§ 1. WHEN by mechanical violence the cohesion of the earth of a bone is destroyed, the softer textures which enter into its composition are lacerated; but as they are naturally of dull sensation, if the injured parts be kept steady they will unite by adhesion, and with so slight a degree of inflammation as not to occasion pain. In young children the cohesion of the earthy part of a bone may be broken without the soft parts being torn;

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\* Vide *Surgical Observations*, vol. ii. p. 189.

may, the bones in early life even admit of being bent in some degree. These cases of fracture of the mere earthy part of a bone in childhood generally puzzle young surgeons. A child having fallen upon the floor with its thigh turned under it, is afterwards unable to walk; the soft parts gradually swell; every motion produces pain; yet the surgeon can detect no disjunction, displacement nor deformity of the limb; he is, therefore, apt to regard the case as one of violent sprain or bruise of the soft parts. It is best, however, to treat such an accident as if it were evidently a fracture, for it is always proper to preserve injured parts in a motionless state; and when thus treated, all pain ceases, and the swelling rapidly subsides, circumstances which seem to identify the nature of the case.

§ 2. In the treatment of a fracture, the first subject to be discussed, in point of order, is the apposition of the broken ends of the bone. These are to be brought into as exact contact as possible. But this should not be attempted till the splints, on which the fractured member is to rest, and which are to keep it steady, have been prepared, for every motion of the fractured bones injures the contiguous soft parts, and induces an irritable state of the muscles, which are apt to cause subsequent displacement of the bones. The treatment of fractures is the same in principle as that of wounds. The separated parts are to be re-applied and kept motionless. The patient is, therefore, to be placed in an easy position in which he can remain without moving, or material inconvenience, till the disjoined parts are firmly re-united. The position of limb which is called a relaxed position has been sought for, and is generally enjoined. In the position so denominated a limb may certainly be kept for a long time without inconvenience; the patient indeed is accustomed to it, and generally takes it during sleep. The fore-arm is, therefore, commonly bent upon the arm, the thigh upon the pelvis, and the leg upon the thigh. Now, although in these positions some muscles are relaxed, others are put upon the stretch, so that the term relaxed position is objectionable. Nevertheless, such postures are easy and natural, and may be long continued without disquiet.

Gentle extension, continued for some time, is the means we employ for bringing the ends of a fracture into apposition, the limb having been previously laid in an easy posture, resting upon a suitable splint; and we generally succeed without difficulty in accomplishing the purpose in view. In many limbs a surgeon cannot tell by the touch when a bone is perfectly set, for he cannot feel its form, and in none is he able to distinguish it when there happens to be much tumefaction of the soft parts. He is, therefore, obliged to judge of the accuracy of co-apta-



tion by the general outline of the limb, and the correspondent position of the joints above and below the fracture. Having adjusted the position as well as he can, whilst the limb rests against or upon one splint, the surgeon now applies another opposite to the former; and these being connected together at different points, a degree of steadiness is given, so that the whole limb may even be moved without any change in the relative position of the fractured parts. It is often exceedingly difficult to set fractures rightly; for as soon as we have succeeded in bringing the broken bones into a proper position, the muscles act spasmodically, and displace the fractured ends even more than at first. In such cases it is better to be content with getting the bones to approximate to their natural situation, and to keep them steady in that position, than to persevere in our endeavours to get them perfectly right, till the irritable state of muscles, the consequence of a kind of alarm from the injury, has abated. When the limb has been kept quiet and steady for some time, the state of irritability subsides, and we may then succeed in obtaining a more exact co-aptation of the broken bones. It is true that swelling having now come on, it is impossible to decide by the touch in what degree we have accomplished our object; we are obliged to judge by the relative position of the joints above and below the fracture and the general aspect of the limb. I have often desisted from my unavailing efforts to reduce a fractured limb to a right position, the spasms that were excited being so violent as to threaten a protrusion of the bones through the skin, and yet have afterwards found no difficulty in bringing the bones into a very satisfactory position. In many cases, also, it has appeared to me that the co-aptation has been effected by the action of the muscles themselves; for when on the subsequent day I had removed the splint, I have felt so well satisfied with the general position that I have done nothing more, and each succeeding day found less cause for interference. In these cases, upon the subsidence of the swelling, scarcely any irregularity could be perceived in the outline of the bone.

A surgeon fell in his own house, late at night, and broke both bones of his leg in an oblique direction. His assistant put on splints, and I was not informed of the accident till early the following morning. The leg was laid upon its side, and having taken care that the splint was well padded and lined, and the limb equally supported upon it in every part, I tried to bring the bones, the ends of which did not at all correspond, into their proper situation by gentle extension. But whenever I made such an attempt, spasms came on in the muscles, and I really was afraid that the bone might be forced through the skin, so

that I felt obliged to desist from these attempts ; I then applied compresses of wet linen, and steadied the limb by an opposing splint. Some gently laxative medicine, effervescing saline draughts, and very small doses of antimonial powder, were prescribed. On the following day the limb was so much swollen that I could not trace the outline of the bones, but they appeared to be much more in their natural situation than when I had left them ; for the internal malleolus appeared to be exactly in its proper position with reference to the internal condyle of the os femoris, and a line drawn from the centre of the patella passed over the middle of the ankle-joint and second toe. I therefore made no attempt to alter the position of the bones ; all uneasiness gradually ceased in the injured parts, and the tumefaction in like manner subsided. At the end of a month the outline of the tibia was distinctly to be felt, nor could the least irregularity be perceived. The sequel of this case will be related afterwards.

Such vexatious occurrences as I have been representing take place in persons of irritable constitutions, and it is often judged proper to give opium with the view of tranquillizing the patient. Though this practice may occasionally succeed, I should not be inclined to adopt it generally ; I should prefer clearing out the bowels with gentle laxatives, and giving such medicines as seem to allay febrile irritation, and promote the secretions in general. When people fall asleep, after having had a limb broken, the sleep is short and disturbed, and each time they wake, spasms come on in the muscles of the broken limb. I have therefore felt myself obliged to prevent some patients from sleeping during the time that the irritable state of the muscles continued. It subsides in most cases within twenty-four hours, and I have never known it last longer than three days. As every new repetition of the spasms tends to prolong their duration by increasing the injury done to the soft parts, and the consequent irritability of the muscles, we should be careful to prevent the recurrence of the spasms by every means in our power. Perfect steadiness must be afforded to the injured parts, and evaporating lotions applied to prevent any increase of temperature. After the first three days surgeons have in general little or no trouble with fractures. The corresponding parts of the broken bone have been agglutinated by blood or an exudation of glutinous substance, and all the vigilance of the neighbouring muscles will now be exerted for the beneficial purpose of retaining the parts in their tranquil position.

The splints which are applied to broken bones should be long enough to confine the joints above and below the fracture in their natural relative positions. They should be shaped to the limb, so as to give equal support to the whole surface to which

they are applied. As the surface of the human limbs is in general but slightly unequal, except where knobs of bone project, straight wooden splints, slightly hollowed out, answer our purpose sufficiently, provided holes are cut in them to receive these projections. For instance, the straight splint which is put between the os brachii and the body, and against which the arm rests in a case of fracture of that member, would press injuriously upon the integuments over the internal condyle, were not a hole cut out to receive that projection. This observation also applies to the trochanter major of the thigh-bone. Such is the inequality of the surface of the leg, however, that a straight splint will not give the requisite support. Mr. Sharp, therefore, contrived to make splints of thick pasteboard, which were stamped into a form corresponding to that of the limb, and then painted. As pasteboard softens with moisture, these splints do not admit of the application of washes to the limb, and are unsuitable for compound fractures. Similar splints have since been made of thin iron plate, japanned to prevent corrosion; they have also been carved out in wood; and either of these answers all the purposes for which splints are applied.

From different parts of the splint on or against which the limb rests, straps proceed, which are attached to corresponding parts of the opposing splint, by means of pegs or buckles. Splints should be well and smoothly padded. This may be done in the following manner. Several folds of flannel should be laid upon the splint about to be applied, and cut to its shape, but so as still slightly to overlap its edges, and the whole compress may then be enclosed in calico. Since I have used this mode of padding, I have never known a patient complain of tenderness from the pressure of a splint, though several have complained of parts on which the limb rested where no splint was applied.

Mr. Sharp had back splints made in the manner before described, to give support from behind in oblique fractures of the leg or thigh, when the limb was laid on its side, a position in which he was accustomed to place it. But it is, probably, better when support is required from behind to lay the limb over the double inclined plane.

When bones are broken in two places, and the intermediate portion lies aslant, compresses to either end of the loose piece may, in some cases, be requisite. Support may also be given in any direction where it seems required by straps of sticking-plaster applied across the interval between the splints which steady the bone.

The inflammation which follows fractures, as in the case of mechanical injuries of the soft parts generally, is of the phleg-



monous kind, and evaporating lotions are therefore of efficacy in mitigating its violence. The inflammatory symptoms soon subside, and the lotions are then to be discontinued, as they would tend to lessen the actions which are essential to the reparation of the injury. As it appears that a degree of vigour of action of vessels is necessary for the process of ossification, it is generally wrong to abstract blood, or to insist on the careful observance of low diet, in cases of fracture. I have known the reunion of broken bones, in many instances, retarded by such conduct.

The time in which the union of fractures becomes unyielding, and sufficiently strong to support the weight of the limb, is exceedingly various. In children, I have known it apparently take place in ten days, whilst in some adults I have seen six months elapse before the union was accomplished. If the uniting medium be not perfectly rigid, it is strained by motion, and inflammation and pain are excited, which are communicated to the surrounding soft parts, and if absolute rest be not immediately enjoined, great and general œdema of the limb ensues. The only mode of judging of the firmness of the union is by an examination, which should never be in any degree forcible, wherein we observe, whether on moving one end of the bone, the other follows the motion in a corresponding manner; and if it does, we have then the assurance that the junction is complete, although we cannot pronounce on the degree of its strength. If after this there be a conviction on the part both of the patient and the surgeon that the bone is firmly knit, the splints may be removed, and the limb suffered to remain upon the bed in the position which had been adopted at the outset. Next day the patient may be encouraged to move the limb a little up and down upon the bed, in a horizontal direction. If no uneasiness attend these motions, he may be permitted to exercise the limb a little more freely, but still with caution, and careful observance of its effects. The leaving off the splints, and this slight degree of exercise, together with gentle frictions to the surface of the limb, are all useful to the soft parts. A consciousness of strength and security is the result of the perfect union of a fracture, and it appears to me impossible to persuade a person who has had a broken limb to lie in bed too long; whilst, on the contrary, serious evils arise from assisting him to get up at too early a period. I have known several instances of fractures snapping after they had knitted, in consequence of motion being allowed at too early a period. In these cases the uniting medium was rigid, but not possessed of sufficient firmness to bear a strain. I have also seen cases where the bones, which were at first united in a straight direction, came

gradually to overlap one another by the yielding of the newly formed bond of union. I therefore make it a rule to proceed in the cautious manner I have above described, and to persuade my patients to remain in bed, and move their limbs in all directions, till they feel assured that they have the power of rising without assistance. By this means I am confident that much time is in general saved; and as an instance, I relate the sequel of the surgeon's case which was commenced in a preceding paragraph of this chapter, § 2. Having reason to believe, after the fourth week of his confinement, that his bone was sufficiently joined not to require the support of splints, I took them away, and urged him to move the muscles and slide the limb up and down, but without raising it off the bed. I also recommended gentle friction to the limb; admonishing him that, if any pain supervened in the junction of the bone, or any oedematous swelling appeared in the limb, the union was not sufficiently strong, and such attempts must be discontinued. When I called upon him a few days afterwards, I found him lying on a sofa in one of the lower rooms of his house; and he told me he was convinced the bone was sufficiently knit, and that it was of great consequence he should leave his room, his presence being necessary for the prosecution of his business. I again expressed my apprehensions, and reverted to the signs which would show the want of due strength in the uniting medium. I believe three weeks elapsed, when a friend of the patient called to tell me that he was still lying on the sofa, with his limb very much swollen, and so painful that he could not use it. He was therefore under the necessity of confining himself again to bed, and having the splints re-applied. Under this treatment the oedema quickly subsided, the outline of the bone could again be traced, and though it was not so perfectly straight now as it had been, yet in a fortnight he was able to rise, nor did any pain or oedema recur.

As the motionless state of the fractured bones is the most important circumstance conducing to their reunion, I would observe that gravitation seems in every instance to be the cause of fixity of position. Thus, when the *os brachii* is broken, and the elbow joint is placed perpendicularly under that of the shoulder, the weight of the arm causes the bone to assume and maintain its right position, so as to require no more than two opposing splints to keep the limb steady. We should be careful not to let the sling which supports the fore-arm extend to the elbow; for if the elbow rest in it, a motion may by this means be communicated to the lower end of the broken bone. If the lower extremity be laid upon its side, and supported upon a splint, the fixity of the limb depends upon every longitudinal

inch of the limb resting with its full weight upon the plane which supports it. Under these circumstances the limb may be lifted up upon a splint as upon a tray, and moved without the slightest alteration in the position of the fractured part,—the application of an opposing splint gives it perfect steadiness. Having been instructed in the early part of my life to put up fractures of the lower extremity in what was called a relaxed position of the limb, I adhere to this practice from a conviction of its excellence. In the cases, however, of oblique fractures of the leg in which the lower portion of the bone is retracted, and which require support from behind, it seems better that the limb should be laid over the double inclined plane, as has been already observed. To accomplish the object of keeping the lower extremity invariably under the circumstances described, namely, every longitudinal inch of the limb resting upon the plane opposite it—it is requisite that the trunk of the patient should be fixed on its side. To effect this, it is necessary that each anterior superior spine of the ilium and the acromion of either scapula should be in the same perpendicular plane. When we lie down to sleep, and turn completely on our sides, in this position we wake without the slightest change. A person laid in this position for a certain time, makes a kind of cast in the bed in which he lies; and this subsequently supports him in the proper posture. A drawn sheet is to be put under the patient, and a sheet of strong pasteboard covered with a napkin may be slid under the buttocks, when the *fæces* are to be discharged, by which means they may be removed without soiling the bed-clothes. I have seen patients lie for three months in this position without material inconvenience. I have known individuals who have twice had their thighs broken, and who, treated the one time by being laid on the back with the limb resting on the double inclined plane, the other by being placed on the side, have given a decided preference to the latter position, although it happened that the union of the fracture was much more tardy on this than on the former occasion. The lateral position of the limb seems to me to be particularly advantageous in fractures of the neck of the thigh bone, where the base of the arch is separated from the shaft of the bone, as it keeps the broken bone steadily pressed against the part from which it has been detached. I have heard this position objected to, on account of its rendering it difficult to compare the length of the limbs with one another; which, however, may be done with as much accuracy as when a patient is laid upon his back. In the latter case we can never be assured that the limbs are equal, unless the two anterior superior spines of the ilium are in a horizontal line. If the two patellæ are then in a parallel line, it is evident



that the limbs are of equal length. If a person lie on his back, with the anterior superior spines of the ilium in the same horizontal line, having the lower extremities extended and the foot straight forward, then will a line, drawn at a right angle with the former, from the centre of the patella, pass over the middle of the ankle joint, the dorsum of the foot, and that toe next the great toe. Under these circumstances there can be neither abduction nor adduction, eversion nor inversion, of the thigh, and we are assured that the limb is straight. This observation can be made with equal certainty when a person lies upon his side; for if the two anterior superior spines of the ilium be in the same perpendicular line, and the patellæ correspond, we have an assurance that the limbs are of equal length. When a person has broken the neck of the thigh bone, and retraction has taken place, we may, by lightly rubbing the limb, and using gentle extension at the knee, gradually bring the thigh to its full length; yet it is apt to be retracted again, when these measures are discontinued, by the action of the irritable muscles. Permanent extension, in a degree adequate to counteract the action of the muscles, may in this case also be applied. A soft handkerchief may be wrapped round the knee, to which a cord may be attached and trained over a pulley screwed into the edge of the bedstead. A light weight, yet adequate to prevent such retraction, may be appended to this cord. In these fractures, as in others, the irritable state of the muscles is but of short duration; and when the bones have rested for a short time in their proper situation and become agglutinated, the muscles will rather tend to maintain them in their proper position than to alter it.

### *Causes of the Non-Union of Fractures.*

§ 3. When fractures have not united at the usual time, we are often inclined to attribute the circumstance to a want of energy in the actions of the medium of union; and we find that the slight injury which is done by such an examination as determines that the bone is not firmly knit, often produces a salutary degree of inflammatory action, which contributes to the consolidation of the bone; for by re-applying the splints and keeping the limb steady, at the same time that we enjoin such a plan of diet and medicine as seems likely to give vigour to the actions of the system in general, we frequently find, on a second examination at no great interval of time, that the union is complete.

The union of fractured bones may be defeated by motion. Experiments on animals, and cases that frequently occur in the practice of surgery, show, what indeed common sense indi-

cates, that a rigid union cannot take place if motion be frequently permitted ; on the contrary, an apparatus calculated to facilitate motion is constructed ; the extremities of the bones become smooth and polished, the surrounding substance is condensed and forms a capsule, and a lubricating fluid is poured into it ; in short, a kind of artificial joint is formed.

To procure a union under these circumstances, it is thought to be requisite that this apparatus of motion should be destroyed. The part has therefore been cut down upon, the fracture from simple being thus made compound, the polished surfaces of the bone roughened by scraping or rasping, and the secreting surface destroyed as much as possible, with a view to procure the effusion of an agglutinating and organizable medium, all motion being afterwards carefully avoided, that might again obstruct the process of due reparation. With the same views a seton has also been passed through these false joints : and as the performance of such an operation as that I have just described is difficult, tedious, and in some instances hazardous, I should, were some such violent means thought necessary to the cure, be disposed to try the effects of the less formidable method of the seton.

In some constitutions, fractures, however steady they may be kept, do not unite by bone, but by a kind of ligamentous matter, in the same way as the fractured patella. In such cases either of the operations just described is of but little avail ; a closer union may indeed take place, but one that is absolutely rigid cannot be procured. I have seen instances in which the abrasion of the ununited ends of the bone was most effectually accomplished, in patients who were intelligent and who kept their limbs in the greatest possible state of quietude, but in which, notwithstanding every precaution and care, no rigid union could be obtained. The constitution of such patients could not be said to want vigour, or to show feebleness of action in general. Several that I have met with were, on the contrary, very athletic men. Some exhibited a manifest dulness of sensation ; for they bore whatever operation was performed without complaint, and the wounds healed without that inflammation which is generally expected as a consequence of such injury. On the contrary, however, I knew one patient who died in consequence of the operation performed in the thigh ; and another whose constitution was greatly disordered, the local symptoms also giving every indication of great nervous susceptibility.

A labouring man fell from on high, and broke the *os brachii* near its middle. He was tall and stout, had dark hair and eyes, and apparently a very vigorous constitution. When the limb

was examined after the usual confinement by splints, it was found that no rigid union had been constructed. The splints were therefore re-applied, in expectation that a longer confinement would be attended with success. The hope was, however, disappointed. Neither did any attempt to excite inflammation in the ends of the bone prove of avail; for though the patient was strong, he appeared to be very insusceptible. Under these circumstances he went out of the hospital and resumed his usual habits of life: the union of the bone became elongated, so that in the motions of his arm it seemed as if there was an additional joint in the middle of the *os brachii*. As he could not continue his customary labour he was re-admitted into the hospital. Mr. Long cut down upon the fractured part, making an oblique incision along the outer edge of the deltoid muscle, and exposing the ends of the broken bone. They were then protruded from the wound, and a thin layer was sawn off each of them. Being afterwards replaced, the wound was closed by sticking-plaster, and the limb steadied with splints. Scarcely any inflammation or constitutional disturbance succeeded to this operation, but neither did any osseous union follow it.

Some fractures, it is alleged, do not unite because of the laceration, and the interposition between the bones of some portion of the soft parts. We ought always to endeavour, in adjusting a fracture, to place the bones in contact; and, in cases where we find it impossible to apply them end to end, to make them touch by their periosteum. The powers of the periosteum in forming bone being very great, it is not improbable that if bones could be applied in this manner, they might more readily unite than under any other circumstances. Sir William Blizard presented the College of Surgeons with the *os brachii* of a patient on whom the operation of exposing and irritating the extremities of the bone had been performed, on account of the non-uniting of the fracture in the first instance. Union took place after the operation; and the preparation shows that the bones lay parallel to each other, and touched only by their periosteum. As I think the particulars of the following case illustrative of the treatment of fractures, I briefly relate it:—

A gentleman past the middle period of life, who had been accustomed to live well, broke his thigh bone about its middle. The limb was laid on the double inclined plane, and the proper position of the bones accurately maintained for between four and five weeks, when his surgeon removed the splints. This patient had been bled at the time of the accident, and was restricted to a less generous diet than that to which he had been usually accustomed. Pain and swelling in the fractured part occurred soon after the removal of the splints; the uniting me-



dium became absorbed, and the bones separated, the lower part being considerably retracted. Between the tenth and eleventh week, the patient came to town, his limb much shortened and everted. It appeared that there was some union, for upon moving his knee his hip was moved in a corresponding manner. He now went about upon crutches, hoping that the junction would become sufficiently strong for the support of his body. One day his crutch slipping, his toe came to the ground, and the union snapped. He was laid upon his side in the manner before described, and the muscles being much wasted, the two portions of his thigh bone could be felt parallel to one another, and overlapping for the space of about an inch. He was kept quiet for three months, when the bone appeared to be so far consolidated as not to require the continuance of splints. He lay in bed another month, changing his position at pleasure, and without exciting pain or inflammation in the fractured part. He now went upon crutches, and was removed into the country. In six months from the date of the second fracture he walked with the assistance of a stick. The wasted muscles gradually recovered their plumpness and power, and at length he became able to walk actively and to a considerable distance. The limb was perfectly straight; nor could any defect be perceived, save that it was shorter by an inch than the sound limb.

### *Compound Fractures.*

§ 4. The mode of union of compound fractures differs from that of simple ones in this particular only,—that the air being admitted to the effused blood, it dissolves and comes away, so that the medium of reparation must be by granulations. As the growth of granulations from the surface of broken bone is a very tardy process, and likely to be rendered more so by a weak or disturbed state of the system in general, we cannot wonder that compound fractures are slow in uniting. It seems that the union in these cases is chiefly accomplished by the periosteum, which throws forth granulations and joins the two bones, although it is still certain that granulations are also produced from the surfaces of bones.

§ 5. When bones are broken very obliquely we sometimes find a sharp point protruding through the skin to a considerable extent; and then it becomes very difficult to draw back the bone into its place. When a man leaps from a height, and breaks his tibia obliquely, the bone sometimes projects even through his boot; and in this case it is necessary to enlarge the wound in order to restore the parts to their situation. Sometimes the bone is crushed or broken into many pieces, some of which are so sharp and angular as to cause great irritation: so

that the mischief done to a limb in a compound fracture is often much greater than what relates to the bone, for the soft parts may be lacerated or bruised in such a way as would of itself suffice to bring on active inflammation and extensive disease.

§ 6. In bad cases of compound fractures, the first subject of consideration with the surgeon is whether it be probable that the injury can be repaired, and whether it may not be more prudent to remove the limb than to attempt to save it. The only general rule that can be laid down to guide us in such a momentous consideration is this:—If we are of opinion that the first symptoms will not be so severe as to endanger life, we ought to give the patient a chance of saving his limb; for every surgeon of experience knows that cases of which he entertained scarcely any hope have, nevertheless, done well; and it is certain that amputations performed on a sudden are generally, by the double shock they impart to the system, productive of very formidable constitutional disturbance, and that the wound made in the operation goes on in a very unfavourable manner. Should amputation become necessary at a future period, it may be performed under much more advantageous circumstances than at the outset. I may add here, that amputations performed immediately after accidents are more likely to do well in the upper than in the lower extremity, and I believe in the thigh than in the leg below the knee. I have seen many diseased stumps, and much exfoliation and disease of the bones after amputation performed below the knee, under the circumstances we are considering; I have also seen a state of delirium induced, during which the patient kicked and tossed about the stump in a very injurious manner. All operations performed on patients who have not been inured to irritation are liable to be followed by great disturbance of the system at large.\*

§ 7. When amputation is performed in cases of compound fractures, after the first symptoms have subsided, in consequence of the powers of nature appearing inadequate to repair the injury, we remove by the operation a great source of irritation from the system at large. The operation now produces tranquillity instead of disturbance, and the wound that is made commonly heals in a kindly manner.

§ 8. Should we determine on attempting to save the limb in a case of compound fracture, or on postponing the operation of amputation which we nevertheless fear may eventually be necessary, we proceed as in lacerated and contused wounds, or as in simple fractures. We lay the parts as accurately as possible

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\* Vide Surgical Observ. vol. i. 6.

in their natural situations, and in a position in which they may be preserved motionless for an unlimited time. It has been recommended in dressing wounds communicating with fractured bones, to close them accurately, and to exclude the air in the hope that the effused blood may remain without undergoing chemical changes, and become organized as in cases of simple fracture. Now, though in some instances it is possible that a considerable extent of the wounded parts may unite by adhesion when treated in this way, yet in many others the nature of the injury must be such as will certainly be frustrative of such an event. Though it may be proper, therefore, that we should aim at the accomplishment of this object, we are never to attempt it by dragging and strapping parts together in such a manner as is rather likely to increase irritation and inflammation.

§ 9. When the bone projects beyond the soft parts, and cannot be readily returned without enlarging the wound, it seems better to do so than to saw off any portion of the bone; yet should the projecting point of the bone be sharp and likely to cause irritation, it may be removed with advantage: nevertheless, it is an object of consequence, to leave as small a chasm as possible in the hard parts to be filled up by granulations.

§ 10. The foregoing consideration would also make me reluctant to remove any pieces of bone that might intervene between the two main portions of the fracture, unless they were much displaced, very sharp and angular, and likely, if left, to produce irritation.\*

§ 11. Having, then, put a compound fracture to rights to the best of our ability, and laid the limb in a position which is natural and easy, and in which it may be long preserved motionless, it is of primary importance to keep down inflammation

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\* An intelligent surgeon, who had visited the museums on the Continent, told me that in Holland he saw a specimen of fractured bone which had been broken into sixteen pieces, the whole of which had become consolidated with one another. This case, however, was not one of compound fracture. If we reflect as to the probability of a detached piece of bone becoming united to the parts which surround it, we must admit that the chance of its continuing to live, and of its subsequent union, are in proportion to the minuteness of the fragment, as it must depend on the surrounding parts to produce a vascular growth to attach it and furnish it with nourishment. There is in the Hunterian collection a dry preparation of fractured femur, in which a portion of the bone, more than an inch and a half in length, had been detached from the shaft and turned completely round, so that the periosteal surface of the fragment lies in contact with the tubular part of the bone; yet in this reversed situation the piece has been firmly consolidated, and the reparation of the fracture is perfect. I have also seen cases of fracture in which a piece of bone has been beaten from its natural situation, and could be felt in another part of the limb, yet no ill consequence ensued. In process of time the fragment seemed to be removed, for it could no longer be felt. It is probable that the piece of bone had in these cases united with the surrounding parts, but had subsequently wasted.



by producing evaporation from the surface. Exposing the parts, and occasionally wetting them by means of a sponge with water, seems the best mode of accomplishing this object. When sticking-plaster is applied to close the external wound, it may be varnished, as has been directed in the case of wounds, to allow of this being done.

There were two cases of compound fracture in St. Bartholomew's Hospital, in each of which one of the main arteries of the limb was lacerated, and in these this practice was productive of the most beneficial results. The limb being supported upon a well padded splint, so that it might be lifted upon it, as on a tray, and moved without any displacement of the relative situation of the fractured parts, one of the dressers contrived to make the opposing splint in the following manner :—Having sawed out such a portion of it as left the wound and surrounding parts exposed, he connected the upper and lower pieces of the splint by means of an iron arch which kept them fixed in their proper position, and allowed an attendant very constantly to moisten the exposed surface with cold water. Under this treatment the hemorrhage, which had been considerable and unintermitting, soon ceased, and did not afterwards recur. The subsequent inflammation was trivial, and these cases did remarkably well. In both, the cellular substance even of the foot was injected with blood; and from the quantity and continuance of hemorrhage, I have not the least doubt of its having proceeded from laceration of the anterior or posterior tibial artery.

Where the soft parts are so much lacerated that suppuration becomes inevitable, we then look forward anxiously to the change which takes place upon the occurrence of a discharge from the injured parts. When there is great tension, a poultice may be applied to soothe irritation and promote secretion.

When the discharge is fairly established, the tumefaction subsides, and the parts become flabby; and the next circumstance which commonly claims our attention is the profuseness of the discharge, which seems from its quantity to be prejudicial to the patient's health. Under these circumstances, unctuous dressings and poultices should be discontinued, and lint moistened with some slightly astringent lotion, as of the sulphate of zinc, should be applied to the wounded parts. Spermaceti salve thinly spread on linen may be put over this application, and compresses wetted with a mixture of spirits, vinegar, and water, laid over all. No one, who had not witnessed the effects of such a change of treatment, would credit the beneficial results that sometimes attend it. The discharge, which had been so abundant as to overflow the splints, often becomes at once moderate in quantity, and healthy in quality.

§ 12. When the powers of the constitution are incompetent to repair the injury, and no general treatment avails us in giving greater vigour to the patient, the granulations which have shot forth from the surfaces of the periosteum and bone cease to grow, and assume an unhealthy appearance, the discharge also differs from that produced from healthy sores. The granulations may gradually or suddenly disappear. The discharge sometimes diminishes so that the wound appears dry, and has a tawny aspect, a kind of irritative inflammation is set up round the injured parts, which, if it continue, ends in sloughing. The patient's state of health also changes, and by its disturbance generally forewarns us of what is going to happen.

When changes indicative of the incompetency of nature's powers to repair the injury of a compound fracture take place, the surgeon ought vigilantly to observe them, and when they become sufficiently declarative of the unfavourable issue of the case, he ought at once to determine on the amputation of the limb; for if he delays till the changes last described have occurred, the system in general will have fallen into the state of irritative fever, which may render the operation unavailing, or will at least prevent the healing of the stump, and subject the patient to a continuance of illness. A slight degree of irritative fever, however, should not deter us from amputating; for this is the only means we possess of giving the patient a chance of his life. In illustration of these considerations I beg to refer to the case I have already related in connexion with the subject of irritative fever. Chap. III. § 13 and 14.

## CHAP. XX.

### *Of Injuries to Joints.*

§ 1. WHEN the ligaments of joints are torn, the object of the surgeon is to re-apply the lacerated parts, and to maintain them in a motionless state till the injury is repaired. But the bones may be so displaced, as to oppose an obstacle to the accomplishment of this indication, and it therefore becomes necessary that the principles upon which dislocations are to be reduced should, in the first instance, be explained.

§ 2. As the ligaments and capsules of joints are inelastic, so are they in cases of dislocation always sufficiently lacerated to admit of the bones being replaced in their proper situations, were not the attempt to do this opposed by the muscles. But

the injury has put these active organs into a state of apparent alarm, and they most vigilantly and powerfully resist every attempt at motion of the dislocated bone, as if fearful of farther mischief being done. We are therefore under the necessity either of eluding their vigilance, or of overcoming their power. The former cannot in general be expected to succeed, although it may occasionally be accomplished. Should a surgeon be inclined to make the attempt, he proceeds in the following manner:—We shall suppose the case to be that in which the head of the *os brachii* is dislocated into the axilla, and rests just below the glenoid cavity of the scapula. Having seated the patient, bent the elbow, and turned the hand supine, the surgeon requests him to support the weight of the fore-arm with the other hand, telling him that he wishes to be assured of the exact nature of the accident before he proceeds to do any thing, and that the examination will be attended with no pain. The surgeon then grasps the elbow, applying his fingers and thumb to the opposite condyles of the *os brachii*, so as to command the motions of the bone, which he then moves gently forwards and backwards, and in a direction from and towards the patient's body. In attempting these motions he finds himself resisted by the muscles, and apprises the patient that this action deprives him of the power of examining, and that if the arm were but left perfectly at liberty, the exact nature of the accident would be speedily and satisfactorily ascertained. He inquires whether the motions he makes are productive of any pain; and when the patient finds that they are not, he will allow the surgeon to move the arm more freely than before. The surgeon now engages the patient upon some topic calculated to fix his attention by the interest it excites, for example, on the manner in which the accident occurred, and then suddenly, and when the patient is off his guard, moves the head of the bone in that direction which tends to replace it in its socket. An attempt to elude the vigilance of the muscles is more likely to succeed after previous unsuccessful efforts to reduce the dislocation have been made; for the patient is then fearless of the trivial motions which the surgeon feels obliged to practice, and the muscles are also weary and disposed to rest. I have known several instances in the course of my life of dislocations being reduced in this manner, both before and after the ordinary methods had been tried without success. In giving the sudden movement to the bone which is necessary for its replacement, we make a lever of the *os brachii*, applying the fulcrum near its head and the power at the elbow. The hand being placed between the arm and the thorax of the patient supports the bone near its head, and by suddenly depressing the elbow to the side, the head of the *os*



brachii is raised over the lower margin of the glenoid cavity, and replaced in its socket. There are many dislocations in the body where the reduction can only be effected on this principle; as, for instance, in the case of the dislocated jaw, and of the os femoris when its head lies upon the obturator muscle.

§ 3. If we do not succeed in eluding the vigilance of the muscles, we must then overcome their power, in order to replace a dislocated bone. In proceeding to do this, our conduct should be regulated by considering that muscles will always act in proportion to the cause requiring their exertion—if we pull violently, they will as violently resist our efforts,—and farther, that the voluntary muscles cannot continue in unceasing action, however slight it may be, for any considerable length of time; if a man holds out his arm extended at a right angle with his body, the effort required in the deltoid muscle is so slight, in proportion to its power, that it seems at first as though the action would be continued for a very long time without fatigue. It is well known, however, that within five minutes the powerful deltoid muscle begins to ache, its action becomes tremulous, and very few people have the resolution or the power to continue the effort beyond an interval of ten minutes. Proceeding on these principles, therefore, we should engage the muscles in resistance to a moderate force, acting in the direction necessary for the replacement of the dislocated bone, and continued without intermission. In this way, by the employment of a very moderate degree of force, continued for a sufficient length of time, dislocations may in general be readily reduced. Prior to any attempt to reduce a dislocated bone, it should be our care to relax as much as possible those muscles which we know will oppose its removal from its new situation. Thus in a dislocation of the shoulder joint, the fore-arm should be bent, and the hand turned supine, the elbow should also be raised from the side, but not to that degree which would bring it into a right line with the shoulder. The cases which most strikingly illustrate the advantage of getting rid of the opposition of particular muscles are those of dislocations of the last phalanges of the fingers or toes. If the last phalanx of the thumb or finger be dislocated, the tendon of the long or deep flexor muscle being affixed to this part, will hold it so powerfully in its unnatural position as to baffle every direct effort that can be made for its replacement; but if we bend the wrist and fingers to the utmost, the long flexors have no further power of action, and by then drawing the dislocated bone in the direction in which it lies, *i. e.* bent upon the joint above, a slight effort suffices to bring the proximal end of the dislocated phalanx upon the distal articular surface of the phalanx above; and having it in this

position, by simply reversing the motion and extending the displaced phalanx it slips into its place.

§ 4. Our success in reducing dislocations greatly depends on our ability to fix the position of the bone to which the displaced one is to be returned. I have contrived to fix the scapula in cases of great dislocations of the *os brachii*, in which reduction must necessarily be difficult; as, for instance, when the head of the bone lies under the pectoral muscle and so high as to be almost in contact with the clavicle, in the following manner:—A slender but very strong cord is made into a circle of sufficient size to encompass the scapula, by passing over its spine behind the acromion and down the dorsum, to within one inch of the inferior angle, whilst in front it embraces the collar bone behind the part where the head of the bone to be reduced lies. This noose is then to be wrapped round with combed wool, or tow, which is next to be covered and sewed up in soft woollen cloth or flannel. To the bandage in this state, four leather straps are to be affixed, two before and two behind; and these should be buckled to screws fastened in a wall close to which the patient is to sit. These screws should be placed far apart, to prevent the straps from compressing the patient's chest when extension is to be made. A piece of soft buff leather should be put round the arm just above the elbow-joint, and over it a sufficiency of soft but strong cord applied in the manner described by Mr. Hey of Leeds, which being, I presume, generally known, need not be repeated. The extending force may thus be made to act upon the bone immediately above either condyle of the *os humeri*. The fore-arm being then bent, and the hand turned supine, the hook of the pulleys by which extension is to be made is to be attached to the cord upon the arm, and the power applied. The pulleys are to be fixed to a staple in the wall opposite to where the patient sits. By this disposition of the apparatus, it is evident that the scapula will be completely confined, whilst ample room is allowed for the descent of the arm-bone towards the glenoid cavity, and that any degree of power necessary for the reduction may be applied in the best direction. A very moderate but unabating degree of force will, under these circumstances, suffice to make the head of the *os brachii* recede from the clavicle and approach its articular socket. The cord of the pulleys should be drawn up a little, as this recession takes place, in order to maintain the unabating re-action of the muscles. When the head of the *os brachii* has arrived as far as the axilla, the surgeon may employ the proceeding already mentioned, that of depressing the elbow, and employing a prop near the head of the bone, but whether any thing is gained from this, I am unable to say; for the reduction

in these cases takes place without any noise or sudden motion to apprise us that it is accomplished.

I have now described the method by which I have succeeded in reducing the worst cases of dislocation of the os brachii, but to employ such an apparatus in common cases is unnecessary.

§ 5. We are indebted to Mr. Hey for a method of making very firm but very soft cordage, which is of great advantage in reducing the dislocated os femoris; it is by rolling up as many yards as may be requisite of calico, till a cord of adequate thickness is formed. The patient may be laid on the uninjured side on a bed having four posts, his thigh being bent at a half right angle upon his pelvis, and his leg in the same degree upon his thigh. His body may also be inclined a little forwards upon his pelvis, whilst his head is laid on a pillow, so that he may lie in an easy position. The middle of the roll of calico is to be placed at the upper and back part of the sound thigh near to the tuberosity of the ischium. It is then to be brought round the limb, so as to cross at the groin and encircle the pelvis just below the crista of the ilium. Being tightened, the two ends are to be twisted together, so as to make a continued cord from opposite the sacrum till it reaches the frame of the bed, near the head, where it is to be secured by an unyielding knot. Surgeons should learn to tie the sailor's bowline and reef knot, and to make clove hitches and half hitches, or they will never accomplish the reduction of dislocations with that nicety which may be attained. Matters being thus far arranged, the dislocated thigh is to be bent at a half right angle upon the pelvis, and extension made at the knee. In ordinary cases the extension may be made by cord of rolled calico applied round the thigh immediately above the knee-joint, and twisted opposite the external condyle of the femur. This cord should be passed twice round the lower part of the bedpost, which is in the diagonal with that part of the frame to which the pelvis is secured, in order that when extension is made, the femur may be drawn in a direction forming a half right angle with the pelvis. Force is now to be applied in a degree sufficient to engage the muscles around the dislocated joint in an opposing action. The recoil of the calico rope is prevented by its second replication round the bedpost, and more of it is to be gradually pulled up and secured as the bone descends, so that no relaxation of the patient's efforts may be allowed. In this way I have reduced thighs dislocated upon the dorsum of the ilium in very muscular subjects at an inn, with no other assistant than the waiter. It is true these were recent cases; but the bone has so regularly receded from its new situation and regained the socket, as to impress my mind with a belief that if extension be made with



the thigh bent at a half right angle, it will always come down where the ilium affords least assistance, that is along the groove in which the obturator externus muscle lies, so as to require no application of force to raise it over the edge of the acetabulum into its socket. In cases of longer standing, pulleys may be employed, as they are unquestionably the best means of producing gradual and unremitting extension.

§ 6. If a new power becomes requisite to raise the head of the thigh-bone over the acetabulum, or to act as a lever when the dislocation is in the direction of the obturator foramen, it may be procured by the application of a calico cord such as has been described placed round the upper part of the thigh. This cord being drawn upwards, we can without difficulty give the bone the direction necessary for its reduction.

Where the extending force is required to be applied in a direction downwards so as to draw the dislocated thigh across the other, it may be given by raising the pelvis upon a cushion above the level of the bed on which the patient is laid, and proceeding in other respects as before.

Such were the principles for the reduction of dislocations which were taught me by Sir William Blizard when I first attended his lectures nearly fifty years ago, and I am convinced that I have had great success in practice by keeping them constantly in view. In illustration of their efficacy, I am accustomed to relate the following cases. I may, however, previously mention that Mr. Pott in his lectures used to express his surprise at the success which attended a vulgar mode of reducing dislocations of the shoulder, when the utmost efforts of the most experienced surgeons had failed. In this mode the patient was laid on the floor on his uninjured side, a cord was attached to the elbow of the dislocated arm, passed through a pulley in the ceiling, and by it the patient was drawn up till his body was just clear of the ground; in this situation he was kept suspended for about ten minutes, in which time the dislocation was reduced. Under the circumstances stated, it is plain that the weight of the patient's body was the extending power, but it was uninterrupted as the law of gravitation, which the action of the patient's muscles could never be.

Passing through the square of St. Bartholomew's Hospital one summer afternoon, when the weather was very warm, I observed a number of students standing at one of the doors wiping the perspiration from their faces, and panting from heat and exertion. They told me they had been trying for an hour to reduce a dislocated shoulder without avail, for the strength of the patient was immense. The man was a coal heaver, and his muscles were so bulky that they appeared to me to equal

those of the Farnese Hercules ; nevertheless he appeared to be nearly as much exhausted as his medical attendants. Being unwilling to lose what appeared a very favourable opportunity for attempting reduction, I asked the patient if he would allow me, upon the following conditions, to try to replace the bone :—1st, That I should give him no pain ; and, 2d, That the attempt should not be continued longer than ten minutes. He consented to my proposition with a smile. Having fixed the trunk of the body and lower costa of the scapula by means of a sheet, I applied a napkin above the condyles of the os brachii ; and, having twisted it so as to fix it completely, gave the ends to two of the heaviest of the students present, telling them to be sure to prevent the napkin from becoming untwisted and slipping over the elbow joint, and, having brought the ends of it close to their own bodies, to lean their weights upon them ; for this force I knew they could continue unremittingly without fatigue. This being done, I inquired of the patient whether he was in any pain, the first condition being that he should suffer none. He having answered in the negative, I looked at my watch and said, “ Now, sir, ten minutes are all I shall require ;” and he smiled in derision, saying it would never answer. But before five minutes had elapsed he expressed himself in a very impatient tone, earnestly desiring that the effort, which he was sure would be unavailing, might be discontinued. I reminded him of our compact, showed him my watch, and told him the time would soon elapse. In two minutes more he declared very angrily that he would not endure it any longer, said he should faint, and at that moment the bone slipped into its socket.

A gentleman was thrown off a stage-coach in the neighbourhood of London, dislocated his shoulder joint, and at the same time received a compound fracture of his tibia. He was taken home, and sent for a very intelligent surgeon, who, being unwilling to put his patient to bed with the dislocated arm unreduced, attempted to replace the os brachii by seating the patient on a chair by one of the posts of a four-post bedstead, whilst he supported the broken leg on pillows placed on another chair before him. The surgeon found, however, that every effort he could employ under these disadvantageous circumstances was unavailing to accomplish the reduction ; and he sent for me to aid him in this dilemma. As the bone lay in the axilla, I told the surgeon I thought it might be reduced without any great effort. The patient's body being fixed as steadily as possible to the bedpost by means of a sheet, I applied a napkin above the elbow, as in the former instance, explained the principles on which I believed success depended, and requested the surgeon merely to lean upon the napkin so as to keep up unaba-

ting extension by means that would not fatigue him. In about five minutes the surgeon began to express his belief that the effort would, like those he had already made, prove unavailing; I urged him, however, to continue, and in half a minute more the dislocation was reduced.

§ 7. In cases of dislocations that have remained long unreduced, measures preparatory to any attempt at replacement may doubtless be instituted with advantage, such as blood-letting, the tepid bath, and nauseating medicines: in ordinary cases, however, such measures are quite unnecessary.

§ 8. Dislocations, like fractures, are often compound; and then inflammation of the synovial membrane and ligaments is likely to ensue, although the parts may have been accurately replaced and steadily retained in their proper position. I have been surprised, however, to see how prosperously these cases in general go on, if augmentation of temperature be repressed by means of evaporation, and a perfectly motionless state of the parts be maintained. Bones and sinews having very low degrees of natural susceptibility are by no means prone to reaction upon transitory, however severe, injury, provided motion and all subsequent irritation be prevented. If the tenderness arising from the inflammation, which, to a certain degree, is the natural consequence of the first injury, be not allayed by anti-inflammatory measures, or if it be aggravated by motion, then very formidable consequences ensue, requiring variety of treatment. But if increase of temperature be prevented by evaporation, and no excitement from motion be incurred, cases of compound dislocation do well in a manner which excites the surprise of those who are unacquainted with the principles upon which the success depends. By acting in conformity with these principles, I have seen cases of compound dislocation of the ankle, of the elbow, and of other joints, recover in a manner that I believe would generally be thought impossible. A gentleman between forty and fifty years of age, and of a weakly constitution, whilst engaged in superintending some repairs of his house in my neighbourhood, fell from a scaffold, and received a very formidable compound dislocation of the foot outwards. The ankle-joint was, indeed, torn open throughout two thirds of its circumference. It was at first thought that amputation was the only resource that afforded the patient a chance of recovery. The patient was lying upon a kind of temporary bed which had been prepared for him in one of the lower rooms of his house, and in a state of great agitation when I first saw him. I begged him not to be alarmed at the frightful appearance of the injured parts, as I saw that I could readily replace them in their natural position.



with a prospect of his doing very well. I desired him to turn completely on his left side, and place the injured limb so that it might lie in an easy position on its fibular surface, bent at a half right angle to the thigh, which was placed in a similar position with relation to the pelvis. I then extended the foot as far as I could move it without using violence, in order to bring the narrow or back part of the astragalus into the intermalleolar space, and to relax the peronei muscles. I drew out the skin which was inverted and stretched tightly over the astragalus, and then, by making gentle extension, and slightly turning the heel and dorsum of the foot inwards, brought the articulating surfaces into their natural apposition. The edges of the lacerated skin came into such exact contact that the wound became scarcely perceptible, and the accident, which had appeared so formidable at first, now seemed of little importance. I was proceeding to give directions to the servants about the arrangement of the bed, when the patient told me he expected some surgeons, who had previously seen him, to return with the amputating instruments. I therefore waited their coming. On their arrival, they seemed struck with the perfectly natural appearance of the limb. They, however, were afraid of the consequences of the injury, and seemed anxious that I should pledge myself that the case would do well. This of course I could not do; but said I was assured no degree of inflammation would immediately come on to endanger the life of the patient, and therefore that it was proper to give him a chance to preserve his limb; adding, that if the powers of the constitution should prove inadequate to the reparation of the injury, amputation might still be resorted to, and with a better chance of success than if the operation were to be undertaken immediately. I then requested permission to do up the limb. The bed being arranged, the patient, in the position already described, was desired to lay himself in a posture which he could preserve for an unlimited length of time, and I placed the leg and foot upon a well padded japaned splint, which is not liable to be acted on by moisture. I then closed the wound accurately and completely with sticking-plaster, which was afterwards varnished, and directed the limb to be kept exposed to the air, and constantly moistened with water, so that there should never be any perceptible increase of temperature, either to the patient or others. A considerable portion of either end of the wound united by adhesion, but the middle remained open, and discharged for a great length of time. The foot and leg were much swelled, and abscesses formed beneath the fascia in four different places. These were opened successively as soon as a fluctuation was distinctly felt; for if this be not done, the fascia will be extensively detached.

and the matter will make its way out by the original wound. The formation of these abscesses in compound dislocations of the ankle-joint, is a very constant occurrence, nor can we be surprised that it should be so, when we consider how much the muscles must have been sprained and drawn from their natural situations, to the injury of their cellular connexions with the fascia. After the interval of a month, the swelling of the leg and foot gradually subsided, and the limb assumed its natural appearance. The wound was not completely closed till three months had elapsed; and it was only after an interval of half a year that the patient was able to bear his weight on the injured foot. The limb, however, at length became a very useful limb, and continued so for many years afterwards, as long, indeed, as I can remember the patient. An accident could not have occurred to a person possessed of less vigour of constitution than this gentleman. I have known a case equally formidable get well in six weeks, so that at the end of that time the patient could use the foot with the assistance of a stick. In this instance the whole of the wound did not even unite by adhesion, and the unhealed part produced exuberant granulations, in appearance very like a fungous growth. They, however, coalesced, became absorbed, and the integuments at length appeared tightly bound down to the ligaments of the joint. It will, indeed, naturally be supposed that the progress of such injuries will very much depend on the constitution of the patient, and I subjoin another case as a farther illustration of this fact. A man of an irritable habit was thrown from a gig, and suffered a compound dislocation of his foot inwards. The surgeon who was first summoned to the accident, which happened at a short distance from London, replaced the parts, but neglected to remove the inverted skin from off the astragalus, so that it was pinched between the articulating surface of this bone and that of the external malleolus. When called to visit the patient, I saw that it was necessary either to re-dislocate the joint in order to remove from the articulation the inverted skin, or to divide it where it was confined between the two bones. The latter expedient appeared the less objectionable, and it was accordingly practised. The foot being turned inwards sufficiently to allow me to get a knife between the fibula and inverted skin, I made the division in a perpendicular direction, brought out the flaps, and re-applied them over the external malleolus. In this case the limb was placed over a double-inclined plane, the foot resting in an extended state on a foot-board. This position did not give the stability which is obtained by placing the limb on its side; and, notwithstanding that the same precautionary measures against inflammation were resorted to in this as in the

cases already related or alluded to, the patient became feverish, the muscles of the limb affected with twitchings, which aggravated the inflammation and swelling, and the symptoms ran so high on the third day that he became delirious. It was then thought proper to take twelve ounces of blood from his arm. This measure I should gladly have seen avoided, as in such a state of constitution I knew there was no redundancy of strength, and, moreover, I looked for the natural subsidence of the febrile symptoms about this period. The blood that was abstracted had none of the inflammatory character. Abscesses afterwards formed beneath the fascia, but they were immediately opened, and eventually the case did well.

A young woman was thrown out of an open chaise, and dislocated her fore-arm outwards to a very great extent, the skin being lacerated half-way round the elbow-joint. This accident happened in the country, and the dislocation was reduced on the spot; the patient, however, came to London, and I saw her. I brought the wounds together and closed them as well as I could, placed the arm in a steady position, and told the patient that the preservation of her limb entirely depended on her keeping it in an absolutely motionless state. The injured part was left uncovered, and continual evaporation employed to prevent augmentation of temperature. Suppuration and discharge from the injured parts took place, but the case, nevertheless, did well in the end.

To show how much may be done by preserving injured parts in a perfectly motionless state, I shall relate yet another instance. A gentleman unfortunately had his hand on the muzzle of his gun when it went off. The charge of small shot passed in a solid mass through the carpus, shattering and carrying away many pieces of bone; but the lateral ligaments of the wrist and the sinews of the muscles of the fore-arm, which are continued to the hand by the sides of the radius and ulna, were entire. The hand was kept in its right position with respect to the fore-arm, by being placed in the hollow of a small splint, extending from the ulna to the end of the metacarpus, whilst pronation was prevented by another splint continued from the fore-arm into the palm of the hand to the same extent. The wounds were covered with simple dressings, and augmentation of temperature was prevented by evaporation. It was a subject of the greatest surprise, to all who witnessed the case, that so little swelling and discharge took place from the injured parts. Some pieces of bone came out at either orifice, but the cavity soon filled up with granulations, and healed in the course of three months. I urged the patient to keep the parts quiet for a much longer period in order that the injury might be repaired as perfectly as



possible. With this requisition he did not however comply, but immediately used his hand as far as he could without occasioning pain, and by degrees its motions became very perfect. I could relate many other cases, but it is not necessary to proceed further in these details ; there is sufficient to exhibit evidence of the efficacy of the means upon the due employment of which I conceive success to depend.

Sometimes the wounds in compound dislocations unite by adhesion, and then the case proceeds as prosperously as when the dislocation is of a simple kind. I have known this happen twice in a case of compound dislocation of the *os brachii*, the head of which projected through the integuments of the axilla. The bone was brought back through the wound and replaced in the socket by gentle extension. The integuments being loose, the edges of the wound admitted of being placed in close contact, and they united by adhesion. I subjoin another case,—one of compound dislocation of the elbow-joint uniting by adhesion,—the circumstances of which cannot, I am persuaded, ever be forgotten by those who witnessed them :—An African maid-servant was carrying a pail of dirty water down stairs in the middle of the night ; her foot slipped, and she fell on the back of the arm against the edge of one of the stairs, still persevering in grasping the handle of the pail. Under these circumstances the lower end of the *os brachii* was driven from its natural situation, and forced through the skin on the front of the fore-arm. Being taken to St. Bartholomew's Hospital, the students sent for Sir C. Blicke to amputate the limb ; but he being unwell desired me to go and ascertain whether his attendance was absolutely requisite. On my arrival I believed that it was so, but suggested to the pupils that it would be right to put the arm into a more comfortable state till his arrival. I placed the thumb of my left hand against the front of the arm so as to press it gently backwards, and drew the fore-arm with my right hand in a contrary direction,—forwards, and as if I meant to bend the elbow-joint. Under this gentle but unabating force the *os brachii* gradually receded through the wound, and the dislocation was completely reduced. Never shall I forget the appearance of the beautifully white and polished cartilage contrasted with the jet-black skin of the African. The edges of the wound opposite the joint came into the closest contact upon bending the fore-arm, and the limb appeared as if no injury had occurred. No sooner had this been done than I began to think what must have happened to the blood-vessels, median nerve, and the other parts which run over the front of the joint. I felt for the pulse at the wrist, but was unable to discover any ; nor did any one pretend to feel pulsation in the radial artery, till about eight or

pine days after the accident. It was determined by the surgeons to try to preserve the limb; the wound, united by adhesion, and the case did as well as a case of simple dislocation would have done. The pulse at the wrist, also, gradually acquired the same degree of strength as it had in the opposite arm.

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## CHAP. XXI.

### *Of Injuries from Chemical Agency.*

§ 1. THE effects of all chemical agents upon the body may be considered as stimulating, from their capacity to excite, or as destructive, from their power to decompose, the animal fibre. The powers of life, it is to be observed, can counteract the effects of chemical agents within a limited degree of intensity; beyond this, the vitality of a part gives it no ability to resist their destructive influence.

As the consequences of injuries from chemical agency in general resemble those which follow the application of high degrees of temperature, we may confine ourselves to the consideration of burns and scalds for an exemplification of this subject.

§ 2. Within certain limits heat is a stimulant, and does not chemically decompose animal substances. Boiling water, for instance, does no more than coagulate the albumen or crisp the fibre of the rete mucosom, and thus cause the cuticle to separate. Yet sloughing is a frequent consequence of scalds, and must therefore be considered as the product of that inflammation which the stimulus of the elevated temperature excites. The vesication that follows scalds is evidently often to be attributed to the same cause; for it follows the application of water much below the boiling point, when it is probable no chemical effect could be produced on the animal solids or fluids. When so great a degree of heat has been applied as to destroy a part, that which has perished requires no surgical treatment except such as may tend to promote its detachment. It is to the surrounding living structures, which are highly stimulated, that our attention must be directed. As the irritation and inflammation consequent on the excitement of a scald or burn may in many cases produce vesication and sloughing, and must in all materially aggravate these common consequences of such accidents, it is important to inquire how we can best allay such irritation and inflammation.

§ 3. The regulation of the temperature of a part, has hitherto

been represented to be the most effectual means of controlling inflammatory action; and, undoubtedly, it will repress, and sometimes subdue, the inflammation consequent on a scald. A scalded finger may be made easy by being plunged into cold water; on removing it, however, the pain and inflammation are almost immediately renewed, even although it has been kept immersed for a considerable length of time; relief is again experienced by recurring to the cold application, and if this be continued long enough, every symptom of excitement may in some instances be overcome, and no injury follow to the part.

§ 4. The plan of treatment recommended by Mr. Kentish rests on other grounds, and there are scientific reasons which satisfactorily account for its practical utility. Mr. Kentish recommends that the treatment of burns and scalds should be conducted on the principle of that which is found essential to the recovery of frost-bitten parts. Instead of the application of cold, which causes a great abstraction of stimulus, he recommends that stimulants be continued, and gradually diminished, till the part acquires a sort of equilibrium with respect to its excitability. The constitutional treatment, he thinks, should be conducted on the same principles as the local. An extensive burn is an injury highly stimulating to the whole nervous system, and he recommends that wine or cordials should be given till the system has attained its equilibrium. In the after stage it appears to me that the injured parts become morbidly susceptible, and require peculiarities of treatment; and so may the nervous system in general, because it must be in a corresponding state.

It is recommended in burns or scalds, that the injured parts should be kept near the fire, till some of the unguentum resinosum can be procured and softened with oil of turpentine. This is to be spread pretty thickly upon lint or linen, and applied, care being taken to keep the dressing smooth by bandage. When the cuticle has been partially removed in undressing the patient, a milder salve of the same kind should be applied to the denuded skin, as the stronger dressing often occasions considerable pain. It is recommended, also, that the patient be put into a warm bed, and have some warm wine and tincture of opium given to him.

To judge of the comparative advantages of each mode of treatment, we may inquire under which of them the pain, that may be regarded as the index of the disorder, soonest abates; under which, consequently, there will probably follow least vesication and ulterior mischief.

Popular observation has declared that it is a long time before the pain of a burn or scald is prevented from recurring when the inflammation is repressed by cold applications; and the fact



is expressed by the saying, the fire is not yet extinct in the part. The same kind of observation has in like manner attested, that some good is done by that treatment which science indicates, and the opinion is expressed by the affirmation that, fire attracts fire from burnt parts.

I have seen many cases of burns in children, from their clothes catching fire, which were treated on the plan just mentioned, in which the patients soon ceased to complain, and in a very short time fell asleep. On awaking they seemed to suffer little, and only trifling vesications followed. The contrast of such cases with those which I had formerly seen treated by cooling applications, could not fail to impress my mind in favour of a plan of practice which is in conformity with scientific principles, and cannot be supposed to be right in some instances, and wrong in others.

It seems, however, impossible to treat burns strictly upon principles similar to those which regulate our conduct with regard to frost-bitten parts. We cannot gradually diminish the stimulus. We have put on the dressings and they must remain. To me it appears that such a plan of treatment as I have described gives ease as permanently as can be expected. It may be a question among surgeons, whether they should repeat the stimulating dressings, and how long they should persevere in this plan of treatment. I should, at the next time of dressing, make use of some milder salve, being aware that injured parts do acquire a state of morbid susceptibility. Neither should I continue the stimulating plan of constitutional treatment beyond a very limited time, nor give opium longer than the mitigation of the sufferings immediately consequent on the injury seemed to demand. The state of the nervous system is, like that of the injured part, morbidly excitable; and many persons having surmounted the first effects of the injury, and whose cases have gone on for a time in a very favourable manner, have afterwards been seized with nervous symptoms, such as anxiety, agitation, and slight delirium, and becoming comatose have died. From what I have seen, I am disposed to attribute these symptoms to too long a continuance of the stimulating plan; for I have observed that patients affected in this manner have been greatly benefited by gentle purgatives and an unstimulating diet. Mr. Kentish also has testified his surprise at the amendment in sores consequent on burns, upon a spontaneous purging taking place, and it induced him to prescribe purgatives in other cases, and they were followed by very beneficial results.

The sores consequent on burns are very slow of healing. This is perhaps owing to debility, the result of the excessive

irritation the part injured has sustained; or it may be from the sore assuming diseased actions. Such sores are to be treated on the same principles as ulcers occurring from other causes.

In extensive burns or scalds in which a considerable district of the skin is injured, the shock which is imparted to the constitution is manifested by different symptoms in different individuals. In some there are extreme chilliness, sighing, oppression of breathing, and irregularity in the actions of the sanguiferous system; and in others the digestive organs appear to be more especially affected, and the stomach rejects every thing that is taken.

Oppression of breathing often comes on in more advanced stages of extensive burns of the skin, and is generally attributed to a sympathy and community of function existing between the organs of respiration and the skin; we should endeavour to preserve that portion of the skin which is uninjured performing its natural function, in order to relieve the pulmonary symptoms.

It need scarcely be added, that extensive injuries of the skin from fire are very dangerous and frequently fatal accidents, owing to the susceptibility of the part injured, to the importance of its function in the animal economy, and from the shock which is imparted to the nervous system in general. The nervous system in the outset is often in that state which we find to be the consequence of very high degrees of ordinary injury. There is no longer any perception of pain from the injured parts. We often see persons who would complain bitterly were their finger slightly scalded, yet when seriously burnt, rolling about in bed and tearing the cuticle from the injured parts, without suffering; but they sigh, their pulse falters, and they become cold; so that wine and opium are given with a view to excite as well as to tranquillize the vital energies.

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## CHAP. XXII.

### *Diseases induced by Substances having poisonous Qualities:*

§ 1. MANY of the substances which produce noxious effects on those to whom they are applied are of animal origin. Some of them by their local stimulation, which is not of a painful nature, gradually induce peculiar inflammation and ulceration, whilst others affect the system without occasioning previous local disease. Sometimes the local and constitutional effects

succeed immediately to the application of the poison, but in other instances a considerable time elapses before these appear.

§ 2. The modifications of animal matter, which are productive of disease in the case of one living creature, have no such influence upon another; and those which act as poisons and occasion disease at one time, do not act in the same way at another. Persons who resist and remain unaffected by the acrid poison of small-pox during a certain period, are, nevertheless, readily infected at some future time.

§ 3. Puriform secretions inductive of diseases which are often of very dissimilar characters, do not differ in appearance from each other, nor from healthy pus. In general, however, the odour of infectious matter is peculiar, and the poisonous quality in all probability belongs to some subtle combination mixed with the general mass. Dr. Rollo and Mr. Cruikshanks, of the Royal Artillery, having some soldiers to inoculate with small-pox at Woolwich, performed the following experiment:— Having equal portions of variolous matter in two watch-glasses, they exposed one to the vapours of chlorine. Six soldiers were inoculated from each portion of the poison; and whilst the whole of those who were inoculated from that portion which had not been exposed to the action of the gas received the infection, not one of the others took the disease.

§ 4. From an attentive consideration of the facts connected with the production of disease by the application of poisonous substances, Mr. Hunter was induced to believe that the application of a peculiar stimulus excited a peculiar disturbance of the vital actions, which, when they were of an ulcerative kind, occasioned the secretion of matter similar in quality to that originally applied. He believed, however, that for the excitement of such actions, susceptibility was a necessary condition. The interval which elapses in many instances between the application of the poison and the production of its specific effects, during which the individual may be unconscious of disease, and yet cannot be absolutely well, he called the state of disposition; and he considered the disease induced as the result of peculiar vital actions, which, in some instances, might be mitigated or removed by actions of a contrary kind. He has published an account of the venereal disease, exemplifying these opinions. He has described, with peculiar accuracy and ability, an evidently specific disease, ulcerative in all its stages, regularly progressive till mercury be employed for its correction, and yielding to an adequate use of that medicine. He exhorts surgeons not to administer it in a degree injurious to the general health, but to regard the abatement of the diseased actions as a proof of the sufficiency of the dose. He however inculcates



the opinion, that a merely alterative course will not answer the end of arresting the disease, and that the remedy must be continued for some time after the suppression of the symptoms against which it had been employed, in order to prevent their recurrence. He gives the following case.—A gentleman had a chancre, for which he used mercury. As soon as the sore had healed, he discontinued the medicine. Three months afterwards he had ulcerated throat and cutaneous eruptions, and he again had recourse to mercury, but left it off at the moment these symptoms disappeared. After the lapse of three months more, he had nodes on his bones; and he then went through an adequate mercurial course, and suffered no recurrence of the disease.\*

§ 5. As this disease has almost become extinct, or is so much modified as to be unlike that which Mr. Hunter has described, and which I had an opportunity of observing in the earlier part of my life, I do not think myself warranted in laying before the public what I have been in the habit of saying to students on this subject in my surgical lectures. The profession is already apprized, that, in my opinion, Mr. Hunter has confounded other diseases with true syphilis; and was thus led to believe that the actions of this malady might be modified by peculiarities of constitution—an opinion unsupported by analogy: for we know of no specific poison whose actions admit of such modifications—we never see small-pox, measles, &c. so modified. It seems to me very unreasonable to suppose that diseases induced by the transplantation of teeth, by the application of discharges from the nurse's nipple or child's lips during the period of suckling, which may affect either the nurse or child, diseases induced even by the animal matter applied in dissection, and diseases produced on the genitals of either sex from communication with parties who have no disease, can all result from one peculiar kind of poison. On the contrary, it seems reasonable to me to suppose that various combinations of animal matter may prove morbid to persons of particular susceptibility, and produce diversity of local sores, some of which may affect the system at large, and occasion constitutional symptoms resembling those caused by true syphilis. When I perceive, also, that the same symptoms do occur in persons who are out of health without the least ground for supposing that any morbid poison has been imbibed, I have reason to believe that the succession of constitutional symptoms we observe, results more from the morbid propensities of the disturbed system, than from any peculiar qualities of an inoculated poison. But

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\* On the Venereal Disease, p. 324. 4to. Lond. 1786.

as I have published the facts on which I ground my opinions on the nature and treatment of diseases which I am inclined to call pseudo-syphilitic,\* I need not now detain the reader with this subject.

### *Of Gonorrhœa.*

§ 6. I shall, however, speak of diseases which have been supposed to result from the same poison that occasioned venereal disease in the form of chancres, &c. Here I am ready to affirm that I have of late years, seen as little of what was called gonorrhœa virulenta when I was a young surgeon, as I have of the syphilitic chancre. The gonorrhœa virulenta was a most active inflammation in the front part of the urethra. The discharge was of very thick pus, having a peculiar and very fetid odour. The disease began by degrees, but soon attained a considerable height, and continued on an average for three weeks; at which time, or shortly afterwards, the inflammatory actions ceased, the discharge became less consistent, and lost its characteristic fetor. The running however still continued, and occasionally for a great length of time, rather, as it appeared in consequence of the disturbance induced, than as an immediate effect of the disease; for I have known instances where the gonorrhœa has ceased without leaving any after-clap, or gleet, and many in which this symptom, when it occurred, has been of very short duration.

§ 7. It is not necessary for me to say how variable cases of discharge from the urethra are at the present day. Many of them seem to occur under circumstances where we have no room to believe that they are excited by the contact of specific poisons;—they are, indeed, evidently the consequence of an irritable state of the urethra. Persons who have strictures of that canal, are very liable to have discharges that cannot be distinguished from common gonorrhœa, after having connexion with parties who are altogether free from disease. The practical question is: How ought such diseases to be treated? It must be a subject of inquiry to the surgeon, whether they affect the constitution, or require mercury for their cure; and on these points the result of my experience is, that they do occasionally, though rarely, affect the system, but that the disease so induced is not of a syphilitic nature, nor does it require mercury for its cure; on the contrary, this medicine in large doses is detrimental. In former times I have known many persons admitted into the hospital with an old pox and a recent clap, and who, by rubbing in mercury so as

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\* Vide Surgical Observations, vol. i. pt. 2.

to affect the system, got rid of the former, but not of the latter malady, which went on more unfavourably and continued longer than it probably would have done had no mercury been employed. To me it seems absurd to attempt to cure diseases in general, when produced by specific poisons. Can we cure small-pox, measles, hooping-cough, or infectious fever? The answer is, No; we can only mitigate their effects: and it appears to me that the same principle should govern us in our treatment of gonorrhœa. By endeavouring to arrest the disease in its progress, we are likely to induce irritation in the remote part of the urethra, and other affections which will be hereafter described; whereas, if we merely soothe the malady and allow it to take its natural course, it declines in due season, without in general producing any material injury to the part affected, or to any other in its vicinity. I therefore do no more than recommend patients to bathe the perineum and genitals with tepid water, by means of the bidet and sponge, for five or six minutes every night and morning; at the same time desiring them to wash beneath the foreskin, so as to remove every thing lodged there, and to wear this part drawn well forwards to protect the orifice of the urethra from mechanical irritation. The washing may be repeated in the middle of the day, around the glans and under the foreskin, for the sake of cleanliness. The bathing the perineum in this manner is recommended, because persons are liable to have slight strictures and other diseases of the posterior part of the urethra, which, if excited by the complaint in the front part of the canal, will re-act and keep up the irritation there. I also recommend those who are affected with clap to be very attentive to keeping their bowels in a regular state, because any inquietude in the lower bowels is likely to produce an irritable state of the urinary organs. I advise them, farther, to take more aqueous liquors than usual, with a view to keep the urine dilute, and prevent it from stimulating the inflamed passage through which it must flow.

If the running continues an inordinate length of time under this merely soothing treatment, I feel persuaded that it is kept up by some slight stricture or disease in the hind part of the urethra, which may require the introduction of a bougie; or else it is caused by the patient's state of health, which maintains irritability in the urinary passage. In this prolonged state of the disease, I should not object to try the effects of copaiba balsam, or cubebs pepper, for they sometimes put a stop to it, although I am persuaded that I have also seen the malady protracted by their use. I have many times been consulted by patients who have had a gleet for nearly two years, and when they have taken the copaiba balsam, or used an injection, the com-



plaint has ceased; it recurred, however, on the discontinuance of the remedies; and I have therefore advised them merely to soothe, and let the disease take its course. Under this plan, it has almost always ceased spontaneously after some little time.

*Of the occasional Ill Consequences of Gonorrhœa.*

§ 8. A person having gonorrhœa is liable to have an inflammation of the testicle; yet this does not, in general, come on while gonorrhœa is at its height, but most frequently when it is declining. Uneasiness is first felt in the vas deferens; the epididymis next becomes tumid and tender; then the testicle swells, and the inflammation extends even to the scrotum. I have no doubt but the swelled testicle, or hernia humoralis as it is called, is produced by irritation occurring in the prostatic part of the urethra, where the seminal ducts terminate, and that it is propagated through one or other of these ducts to the testis. The grounds on which this opinion is founded, will be afterwards stated. If, when the testicle has become swollen, the patient does not confine himself to bed, he is in general seized with a fit of shivering and fever, the part becomes excessively painful, and he finds at last that he must betake himself to bed. The horizontal position contributes greatly to the mitigation and cure of this malady, by allowing a free return of the blood from the surcharged vessels. The weight of the part should be more completely taken off, by means of the common suspensory bandage, which will also have the effect of keeping it in one position. The temperature should be regulated by evaporating washes, or by the bread-and-water poultice; which latter, in consequence of its exciting gentle perspiration, has appeared to me a very useful application. The bowels should be kept open, and small doses of antimonial powder may be given to allay febrile action. Under this treatment the violent pain and febrile excitement generally cease in about twenty-four hours, and the patient feels comfortable. The swelling gradually subsides, and the patient is desirous of getting up; but if he do so, he is liable to a recurrence of suffering, from severe pain and a paroxysm of fever. When these consequences of such imprudence are induced a second time, the pain is generally felt more in the groin, and extending to the loins, and not, as during the first attack, in the cord, epididymis, and body of the testicle. These symptoms soon yield by a return to the plan of treatment first adopted. I have observed that the testicle generally remains irritable, and liable to these renewals of the disease, for about three weeks after the first attack; and I am therefore inclined to believe that the irritation in the prostatic portion of the urethra usually subsides about this period. I

have known many persons, who, having suffered most severely from swelled testicle on former occasions, submitted to confinement for about three weeks after they perceived the testicle was affected, and thus escaped with only a very trifling enlargement of the gland. Inflammatory symptoms and fever did not gain any degree of intensity, and the pain never increased so as to be troublesome. This circumstance leads me to conclude that the disease consists in an irritable state of the affected parts, and that the degree of inflammation is the consequence of impropriety of conduct, or of neglect of those measures of precaution by which it might be rendered of trifling importance.

It is a common practice to apply leeches to the swelled testicle, or even to bleed from the arm; but I have not myself found these measures to be necessary.

§ 9. There is scarcely any instance of gonorrhœa, in which some irritation and slight tumefaction may not be remarked in one or more of the inguinal glands, and, in unhealthy subjects, they may inflame and suppurate. This is the consequence of mere irritation. There is no contamination; nor should mercury be employed.

§ 10. In gonorrhœa, inflammation sometimes takes place externally in the skin covering the glans penis, and lining the foreskin, and is followed by a puriform secretion, which is called gonorrhœa of the prepuce. When this happens, there is commonly less irritation and discharge from the urethra; the discharge, indeed, seems in some instances to be totally suppressed. Upon the cessation of the external inflammation and secretion, however, the disease in the urethra will recur. The irritation thus communicated to the glans and foreskin often occasions ulceration of these parts; but the sores which are then formed, get well without mercury. Occasionally, swellings about the size of horse-beans form around the lower part of the urethra. They are usually met with opposite the *frænum preputii*, in front of the scrotum, and in the perineum. These swellings frequently suppurate; and the abscess may discharge itself outwardly, inwardly into the urethra, or in both these directions; in which latter event, drops of urine may make their way through the cavity. These swellings I believe to arise from inflammation beginning in the mucous structures belonging to the canal of the urethra. They are the result of irritation, and soothing measures are alone requisite for their cure. I have known them occur in three situations in the same patient—opposite the *frænum*, in front of the scrotum, and in the perineum. They get well spontaneously, though slowly. Abscesses sometimes take place beneath the fascia of the perineum, around the tube of the urethra, its bulb and spongy substance. As this

fascia is strong, more especially about its middle part, the abscess does not project, nor does the skin become particularly inflamed. The matter slowly makes its way either forwards or backwards. When it comes forwards, it projects as a nodule at the posterior part of the scrotum; when backwards, it protrudes by the side of the rectum. During the whole of this process, the patient's sufferings are very severe; they are only completely relieved when the abscess is opened. This, therefore, ought to be done as soon as a fluctuation can be discovered in the perineum; by which means, the fascia will be divided, and its injurious detachment prevented. These abscesses occur in simple gonorrhœa, without any opening being formed in the urethra by which the urine may escape.

§ 11. In gonorrhœa, irritation is apt to extend along the urethra; and various inflammatory affections of this canal, and of the other urinary organs, may be thus induced. The irritation in a deep-seated part of the urethra may occasion an irritable condition of the bladder, marked by uneasiness and a frequent call to void its contents; or the lining of the bladder may be affected, as it is continuous with the lining of the urethra, and greatly aggravate the irritability of the organ. I saw many very distressing cases of this kind in the earlier part of my professional life,—the patients starting up every half hour, with a painful and imperious call to void their urine, which prevented them from getting any rest: and this state I have known continue for weeks. The affection I am describing, will, however, generally give way to the application of leeches to the perineum, to tepid bathing and fomentations, with attention to keep the lower bowels cleared out, so that they may be in a tranquil state. Should these measures not prove quickly successful, which they generally do, opiate clysters will be found useful auxiliaries.

The irritation in the canal of the urethra sometimes prevents the natural actions of the bladder for the expulsion of urine, and a degree of retention takes place, which is very annoying to the patient. For the relief of this symptom, the various means just suggested should be employed with assiduity, and they will seldom, if ever, fail of success. I have known many surgeons attempt to relieve the retention by the introduction of a bougie, which though it have been of small size, and soft, they have yet failed to pass through the whole length of the canal. When withdrawn, the bougie is found to be nipped and bent in many places, as if it had been grasped by a corresponding number of strictures. This occasions great uneasiness in the mind of the patient, by inducing him to believe that he has a much diseased urethra. The retention of urine gradually subsides, but the



anxiety of the patient continues; and I have been consulted very frequently by patients in this condition. Upon inquiring in what kind of stream they void their urine, they frequently reply that it appears a very good one. I tell them to allay all irritation that may yet remain by local tepid bathing, and to insure the effectual performance of the functions of the bowels by small doses of castor oil. After this, to relieve their minds of all anxiety, I take a full-sized soft bougie, and pass it into the bladder; thereby convincing them that the former impediment arose from temporary irritation and inflammation, and not from permanent disease. Precisely similar effects follow the irritation of the urethra consequent on the use of cantharides. Sir Ev. Home informs us, that a patient being seized with a retention of urine after the application of a blister, he tried to pass a small soft bougie, but without success; it was indented and bent in the manner I have described; yet when the retention had subsided, he passed a full sized bougie without impediment.

### *Of Strictures of the Urethra.*

§ 12. If irritation and inflammatory disposition thus excited in the urethra, be continued from constitutional or other causes, even though in a slight degree, the foundation may be laid for permanent stricture, by a habit of contraction being induced in one or more parts of the canal. The establishment of local irritability, accompanied with slight inflammatory action, produces a projection towards its centre in a part of the canal, and a consequent contraction in the calibre of the passage. Such, probably, is the origin of strictures generally, not only of the urethra, but of the œsophagus, bowels, and all canals possessing irritability. In the urethra, the irritation and inflammation may become established in that part of the canal which traverses the prostate; and here no contraction of the passage takes place. This may occur, with or without stricture, in that part of the canal subject to contractions.

Where a person voids his urine in a slender stream, and with straining, it is reasonable to suspect that he has stricture. Yet stricture may exist without any evident diminution of the stream of urine; the bladder having acquired an increased power of expelling the urine, equivalent to the obstacle opposed to its discharge.

§ 13. It seems right in all cases to soothe irritation in the urinary canal, by means of tepid bathing and the regulation of the bowels, before we proceed to examine the urethra to ascertain the number and situation of strictures, and other circumstances of disease that may exist in its course; for the introduction of a bougie without these preliminaries is apt to ag-

gravate irritation, so as even to bring on retention of urine. The bougie that is selected, should correspond in size to the stream of urine that is voided, and should be slightly curved like a catheter, so as to accord with the form of the urethra as far as the bulb, and enable the surgeon, by depressing the end he grasps, to make the point describe the same circular sweep as the remainder of the canal. The bougie, being oiled, is to be gently and slowly passed along the urethra: if obstruction be met with, it is to be kept steadily but still gently pressed onwards; for the action which its touch excites in the urethra will abate after a time, and leave it at liberty to proceed. It may in this way be repeatedly opposed by successive strictures, and yet it may pass through the whole length of the canal. Should we, however, fail in this attempt, or should the bougie bend, we withdraw the instrument, and find that it is or is not indented by the obstacles it has passed, which indicates the degree of irritability of those parts. We then take a smaller bougie, and having passed it as far as the former, we gently urge it forward; when it may either go on and enter the bladder, or be resisted as in the first attempt. It seems advisable not to do too much at a time; for as irritation and inflammation are the primary causes producing and maintaining stricture, we should avoid all that has a tendency to excite or to aggravate these conditions. All excitement occasioned by the first introduction of the bougie should, in my opinion, be suffered to subside before any attempt is again made to pass this instrument. The impression made by the last stricture upon the point of the bougie formerly used, will serve as a guide to the size proper to be employed upon the succeeding occasion.

§ 14. The benefit derived from bougies appears to me to depend on their action as mechanical stimulants. They appear to subdue morbid irritability in the same manner as chemical stimulants. (See what is said on this subject in Chap. 12. § 5.) The truth of this proposition is very manifest in many cases. Persons who complain loudly on the first introduction of a bougie, suffer less and less upon each successive repetition of the operation, and at last declare it occasions them no uneasiness whatever.

§ 15. Though we have failed in passing the bougie through the whole of the channel at the first attempt, it does not follow that we shall be unsuccessful at the second; should we, however, still be foiled, if we have but gained a little ground we should be content, and proceed on the principles described, till we have accomplished our object completely. As the irritability of the urethra declines by the regulated use of bougies, conducted on the principles proposed, we have it in our power to use

greater liberties in urging them on, and in introducing larger sized instruments.

§ 16. Sometimes strictures are very irritable, and indent the bougie, causing it to appear as if a string had been drawn tightly around it; occasionally they even force up the wax from its surface. In either case the progress of the bougie is impeded. Strictures, which are permanent contractions in the urethra, may be spasmodically affected in different degrees; yet the term spasmodic stricture, as applied to an obstacle resulting from mere spasm in the canal, is improper. When strictures are irritable, or spasmodically affected, flexible metallic instruments in the form of bougies may be passed though wax ones cannot. These metallic instruments, indeed, from the fine polish of their surface, and their susceptibility of being curved in any degree, are, at all times, well calculated to be passed through the urethra, and to restore it to its natural dimensions.

§ 17. Strictures seem in general to be produced rather from the under than from the upper surface of the urethra, and being of a crescent shape, they create a peculiar impediment to the advance of the bougie, more especially when the contraction occurs in the posterior curve of the canal. Under these circumstances, and to enable a bougie to surmount the obstacle, it is necessary to keep the point of the instrument in contact with the upper surface of the urethra; and this may be done by turning up the point of the bougie so as to make a half right angle with the general course of the instrument. I have known many instances, in which the foremost strictures had been considerably enlarged, and the patients made water in a good stream, and yet where a bougie could not be made to pass into the bladder. Patients on this account often suffer greatly from anxiety of mind. But by selecting a bougie of a proper size, adopting the expedient just described, and depressing the outer extremity of the instrument so as to make its point travel along the upper part of the canal as it approached the seat of the stricture, the bladder has been entered without any impediment being encountered.

Sometimes the stricture is produced from the side of the urethra, and the point of the bougie then requires to be guided in the contrary direction to enable it to pass into the aperture. All these circumstances have been particularly explained and attended to by Mr. Whately, whose work seems to me to deserve the careful perusal of professional students.

§ 18. We sometimes meet with cases in which we cannot introduce the point of a bougie into the last stricture, and in these it may seem vindicable to apply the *argentum nitratum* in the manner practised by Sir Everard Home, or the *potassa fusa* as recommended by Mr. Whately. These measures have unques-



tionably been productive of great good in cases which it was found impossible to relieve in any other way; and I entertain no doubt but they have also been the occasion of great mischief, when unnecessarily or indiscriminately employed.

The touching an irritable stricture with *argentum nitratum* seems to produce the same effect as it does when applied to the surface of an irritable ulcer: the stricture becomes less irritable in consequence, and will sometimes admit the point of a small bougie, which could not be introduced prior to the application. Potassa when used in Mr. Whately's manner does not act as a caustic, but only as a stimulant. Upon its application to a stricture the contraction gives way, as if to avoid its contact, so that we are enabled to move the bougie a little on the interior of the contracted part. The application here, as in the other instance, has the effect of leaving the stricture less irritable after the temporary excitement it at first occasions has ceased. If a surgeon can pass a bougie through the whole of the canal that is liable to stricture, and if there be not in the state of the patient's health a cause maintaining irritability of the urethra, he may in general succeed in restoring the channel to its natural calibre by the employment of common bougies in conformity with the principles suggested. The medical treatment of the disease upon principles hereafter to be mentioned, is, however, essential in many cases to the success of the surgical measures which may be adopted. I would also further observe, that the establishment of a permanent state of irritability in the prostatic portion of the urethra seems to me to militate much against our endeavours to cure stricture; and to this subject I have called the attention of the profession in my *Surgical Observations*.\*

An opinion has very generally prevailed among surgeons, that strictures are enlarged by dilatation. This idea seems to me calculated to lead to the too frequent or too forcible introduction of bougies. I have already explained the principle upon which I suppose them to act beneficially. I grant that, as the part becomes less susceptible, the surgeon may occasionally introduce a bougie, which does in some degree stretch the stricture, and with advantage; but that strictures get well without dilatation is proved by the circumstance of their cure by means of varnished or elastic gum catheters. In several complicated cases of great obstruction of the urethra, in which the patients scarcely void any urine by the natural channels, almost the whole of that fluid coming away through numerous fistulous openings in the perineum and scrotum, I have been so fortunate as to introduce one of these tubes of the smallest possible dia-

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\* Vol. i. p. 172.

meter. It was curious to see the patient make water through it, the stream being as fine as a hair, and a long time elapsing before a teacupful of urine was passed. But a tube of such slender dimensions could not be supposed to remain pervious. Accordingly, no second discharge of urine took place through it, for it was almost immediately clogged up with mucus; yet between the instrument and the walls of the urethra the urine still continued to be discharged. At the end of a week this catheter was removed, and another, of twice its magnitude, introduced. This, like the former served as a passage for the urine only once; the fluid, however, continued to be discharged in greater quantity than ever by the natural channel. Every week the catheter was withdrawn, lest it should become encrusted with calculous matter, and in its stead one of double the size was introduced, till the urethra admitted a full-sized instrument. In this period of time, which did not exceed two months, the sinuses which existed in the perineum ceased to discharge, and were for the most part healed.

To show that the enlargement of the urethra, when effected by the use of these instruments, will not be permanent if the constitution be in an irritable and disturbed condition, I shall relate the following case:—A gentleman, who had been under the care of more than one intelligent surgeon, came to London to consult me upon his case. The urethra was so irritable that no progress had ever been made with the common bougie; and he told me he never had obtained any benefit except from the application of caustic. I therefore applied the potassa in the manner suggested by Mr. Whately, and the case seemed to go on very prosperously for some time, when a fit of irritation occurred, and the bladder became particularly affected; for a large quantity of mucus was discharged with the urine, and the calls to void it were frequent, urgent, and attended with great pain. Upon the patient's recovery from this state, which was combated by soothing measures, I declared my unwillingness to re-adopt the former plan of treatment. This declaration seemed to plunge him into the depths of despair, but I comforted him by stating the good effects of wearing the varnished catheter, an expedient which had not been tried in his case.\* I called on him, and succeeded in introducing one of these instruments of no inconsiderable size, which was suffered to remain, and only withdrawn after a week, to be replaced by another one third larger. In a short time, I passed an instrument of a size

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\* This case occurred to me very soon after the manufacture of these instruments was brought to perfection in Paris, about the year 1790.

larger than my patient had in anticipation conceived would be necessary ; and when he withdrew it at the end of a week, as usual, he found that he could make water in as large and forcible a stream as any healthy person, to his great surprise and satisfaction. I told him he might now, if he pleased, discontinue the instrument, and allow me to introduce a bougie once a week, with a view to determine how far the enlargement of the canal that had been obtained would be permanent. When he came, according to appointment, owing probably to temporary irritability of the canal, I was unable to pass a bougie, and he sunk again into despondency. I endeavoured to persuade him that the difficulty arose from temporary irritation, and that I should succeed next time he came. As he did not appear, however, I went to seek him at his lodgings ; but he had gone away, no one knew whither, and I saw him no more. In all these cases, therefore, the relief is but temporary. If the state of health which produced the disease continues, the contraction will return.

§ 19. Secondary diseases of the urethra and neighbouring parts, of the same nature as those induced by the poison of gonorrhœa, are brought on by chronic irritation of the canal. Under these circumstances, however, the affections are generally of a milder description. Chronic disease in the testis very frequently derives its origin from irritation in the prostatic portion of the urethra. To this subject I have already endeavoured to call the attention of the profession in my *Surgical Observations*.\*

Disease may also be induced in the glands of the groin, where there happens to be a constitutional disposition to such affections, by a chronic affection of the urethra. The interior membrane of the prepuce, affected from a similar cause, may become thickened and white, so as to render it difficult to retract the part ; it may become the seat of sores ; or such as are the consequence of sexual intercourse may be rendered peculiar and intractable. The growth of numerous warts seems also sometimes to be the effect of an irritable state of the foreskin and covering of the glans. These warts are very apt to grow from the surfaces or cicatrices of newly healed sores, and indicate a kind of morbid irritability which requires to be soothed. These considerations I have also already submitted at greater length to the notice of the profession.†

Indurations of the mucous structures of the urethra also follow chronic affections of this passage, as they do the more active

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\* Vol. i. pt. ii. p. 172.

† Ibid. p. 210.



disease gonorrhœa. Abscesses likewise form round the urethra, beneath the fascia of the perineum, as in gonorrhœa. In this case the difficulty of making water which proceeds from stricture, when this complaint exists in addition, is greatly augmented by the pressure of the collected matter, which, therefore, requires to be evacuated as soon as it can be distinctly perceived. The urethra may also ulcerate in some part of its course, and give issue to a small quantity of urine, which excites inflammation, suppuration, and thickening in the cellular tissue around, and causes an abscess, the track of which is very apt to become fistulous. Sometimes the urethra sloughs or ulcerates to a greater or less extent behind the stricture, and the patient, then endeavouring to relieve himself with the whole force of his bladder and expiratory organs, injects the cellular membrane of the scrotum and penis with urine, which has the effect of exciting irritative inflammation and mortification of all the parts with which it comes in contact.\*

#### *Retention of Urine.*

§ 20. Retention of urine may happen from mere irritation and spasm, without any organic disease, as is proved by its sympathetic occurrence in cases of injuries done to the lower extremities. To show this I relate the following instance:—A man was admitted into St. Bartholomew's Hospital on account of compound dislocation of the ankle-joint. On the second day he was unable to void his urine, and it was directed to be drawn off night and morning. This I accomplished, though with difficulty, for five successive days. To show how irritable the parts were, I may mention, that when I passed the catheter down to the bulb, with the convex part of its bend towards the abdomen, the instrument was turned round by the action of the patient's own muscles, and was only got to pass onwards by keeping up the gentlest degree of pressure unremittingly, the urethra gradually yielding to its progress. On the evening of the fifth day I found I could no longer introduce the instrument; but I resolved to employ no force, and directed leeches, and afterwards fomentations, to be applied to the perineum. I also desired that the patient should take some castor oil. At this time I was young in the profession, and came to the hospital early the following morning, apprehensive of all the evils that attend an unrelieved bladder; but I found, to my great joy, that the patient had passed his urine in the natural way; at first, indeed, only in drops, but afterwards in

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\* For cases illustrative of both these views of this subject, vide *Surgical Observations*, vol. ii. p. 250.

a stream of no inconsiderable size ; nor did any retention subsequently occur. This man had perfectly sound urinary organs ; and undoubtedly the continued irritation, occasioned by the introduction of the catheter, had aggravated and kept up the inflammation which caused the retention. To show the sympathy that exists between the urethra and the nerves which supply the leg and foot, I may mention a whimsical circumstance which occurred at St. Bartholomew's Hospital :—A man who had had his leg amputated aboard ship was admitted on account of ulceration of the stump. When he made water he felt violent pain in this part—a circumstance which led me to suspect disease of the urethra ; and, in fact, strictures were found. These being relieved, and becoming less irritable, he ceased to have any uneasiness in the stump when he passed his urine.

§ 21. In general, when retention of urine comes on, it is the result of irritation and inflammation supervening upon disease of the urinary passage, most frequently upon strictures. In order to ascertain the state of the urethra before the attack of retention, it is right to inquire of the patient in what kind of stream he was in the habit of voiding his urine ; if he answers, at all times in a very small one, and sometimes only by drops, there is great reason to believe that there is a stricture so much contracted as to give little hopes of success from an attempt to introduce the catheter, or even a bougie, while the irritation and inflammation continue. Our knowledge that the retention is occasioned by inflammation and spasm occurring in the urethra, is further derived from the patient's complaining of tenderness along the urinary canal, which is aggravated by pressure. We ought, therefore, to adopt that plan of treatment which is most likely to allay irritation, and mitigate or remove inflammation. And here I may observe, as a considerable time may elapse before the patient is relieved, and the complaint is equally disturbing both to mind and body, we should arrange our plan of treatment so as to afford to the patient successive occupation, and expectation of relief. In the first place some castor oil should be given ; for it often happens that, in the act of discharging the bowels, some urine will dribble from the urethra relieving the patient's sufferings and encouraging his hopes. Preparations should be made for using the tepid bath ; and, in the mean time, leeches, in numbers proportionate to the strength of the patient, should be applied to the perineum ; and if he be young, or the action of the sanguiferous system be generally excited, it will be proper to take blood from the arm. The patient may also use tepid bathing to the perineum, by means of the bidet and sponge, for five or six minutes at frequent intervals. In stooping forward while bathing in this

manner it often happens that a little urine escapes, which both gives ease and keeps up the patient's spirits. Even although this has not happened on the first employment of the means, it is likely to occur subsequently; and the patient should be encouraged to hope that it will do so. All these measures keep the patient's attention engaged, and afford him occupation—matters of great importance in bringing this complaint to a successful issue. As soon as the tepid bath is got ready it should be employed. After the bowels have been acted on by the castor oil, the patient should be put to bed, and have a folded flannel-cloth wrung out of comfortably tepid water applied to the perineum, and covering the genital organs and hypogastric region. A napkin may be put over this, to keep the bed-clothes from getting wetted; and if the patient be covered up warmly, the flannel will not require to be renewed till it is getting dry. Forty drops of laudanum in some thin starch may be injected as a glyster, and repeated so as to lull the nervous system. Thus situated, the patient sometimes finds that he has discharged a little urine into the fomentation flannel; and it is generally known, that if the urine begins to drain off in this manner, the quantity will increase, and the patient recover from the attack without further measures. Nauseating medicines, as small doses of tartrate of antimony, or of the tinct. of the muriate of iron, may be given. Of the latter, Mr. Cline, who first ascertained its efficacy, and had great confidence in its effects, used to say, that he considered it applicable in those cases only where the retention depended more on irritation than on inflammation.

§ 22. Should, however, the measures which have been suggested prove unavailing, we are called upon to examine the urethra, which is best done by bougies; and if we find a stricture at the beginning of the membranous part of the urethra which opposes the advance of the smallest metallic instrument that can be introduced, it becomes our duty to divide the obstruction. This is to be accomplished by making a cut, as in lithotomy, to the left of the raphé of the perineum, and down towards the seat of the stricture, feeling for the point of the sound or catheter. The urethra is then to be exposed, and the course of the canal backwards to be searched for; and we may be assisted in the discovery of it by the distention of the posterior part of the canal whilst the patient is attempting to discharge his urine. A small opening is then to be made in the urethra, and continued forwards, so as to lay bare the point of the director, which may now be conducted onwards into the bladder; or the staff may be removed and a bougie substituted in its stead. If, in this way, we can introduce the smallest var-



nished catheter into the bladder, we should suffer it to remain. If this cannot be done, however, we may pass a bougie from the artificial opening into the bladder, so as to keep the communication clear, and abstain from any further measures until the patient has recovered from his sufferings and fatigue, after which, the steps that are still necessary to accomplish the object in view—the passing a flexible catheter along the whole track of the urethra into the bladder—may be again attempted.

§ 23. In some cases in which we are called upon to operate, we may fail to discover the course of the urethra behind the stricture, the parts being consolidated with one another by adhesive inflammation, or in consequence of the long continued contraction of the urethra, so that a certain portion of the canal appears like a cord. Under these circumstances, we are obliged to puncture the bladder: an operation, however, which we are not vindicated in performing until all other means for the patient's relief have been tried and have failed. We are relieved from all apprehension of wounds of the urethra remaining fistulous, by finding them heal so readily after the extraction of stones from that canal. Although no instance may be required to corroborate this well-known fact, yet, as there is something curious in the following case, I am inclined to insert it here:—A boy about fourteen or fifteen years of age was overthrown, and fell with his hypogastric region against the edge of a bench. His bladder doubtless was full of urine at the time, and the impulse given by the blow forced a calculus, somewhat larger than the largest pea, half way through his urethra. Under these circumstances he could not void his water, and was brought to St. Bartholomew's Hospital. The stone lay in the canal at the place where the middle of the scrotum depends. The scrotum being drawn forward the stone was exposed, and extracted without the slightest difficulty. In this case I tried to introduce a small bougie from the wound into the bladder without success: the irritability of the urethra seemed to render it impervious, and prevented me from discovering it. The wound was dressed with simple dressings; and the patient discharged the contents of his bladder partly through the recent aperture, and partly by the natural channel. The wound soon healed, and the boy passed his urine in as large a stream as he had done before the accident.

§ 24. It was the opinion of Mr. Pott, a surgeon undoubtedly of great experience, that it was wrong to employ instruments in cases of retention of urine proceeding from irritation and inflammation; but the distress of the patient often induces the surgeon to attempt the introduction of a bougie. If he succeeds, upon withdrawing the instrument after it has remained in the

canal some little time, the urine is frequently discharged ; apparently, a greater degree of spasm being excited by the instrument, a proportionate relaxation of the canal succeeds, during the continuance of which the patient is enabled to void his urine. Yet in these cases the retention has recurred ; and I believe the patient, for this temporary relief, has generally had his sufferings prolonged. There is a naturally established alternation of action between the expelling and the retaining power. If the urethra be in a state of excitement the bladder will not act, as is manifest in persons under the influence of sexual desires, who, though the bladder be full, cannot void their urine for some time either before or after intercourse. This observation also applies to the different powers belonging to the bladder itself. The retaining power being in a state of irritability, the expelling power will not act, and *vice versa* ; as seems manifest in the cases of many persons who void their urine during sleep, in which the bladder is either spontaneously irritable, or is excited by some irritation in the urethra. I have known cases of retention of urine which were, I think, undoubtedly caused by an irritable state of the sphincter vesicæ : the catheter could be passed without difficulty through the urethra, and as soon as it entered the bladder the urine was projected through it in a forcible current. In the cases to which I now allude there was no enlargement of the prostate ; but it was necessary to draw off the patient's urine night and morning until the faulty action had subsided. Cases of this description do not, however, appear to me to be frequent.

*Retention of Urine from Enlargement of the Prostate.*

§ 25. If when called to a case of retention of urine, upon making inquiry, in what sort of stream the patient has been accustomed to pass his water, he answers, that he has perceived no difference in the size of the stream, but that he does not project it as he used to do at an earlier period of his life, there is reason to suspect some disease of the prostate. Many patients affected in this way have told me that they felt a necessity for making urine at regular intervals, but having neglected to do so at the accustomed time, they found that they no longer had the power, and in fact that the more they endeavoured, the more the obstruction seemed to increase. These patients have no tenderness in the track of the urinary canal. A full-sized soft bougie may be readily passed throughout the whole urethra, and down to the prostate, but it does not enter the bladder, being prevented by the projection of that part of the gland which Mr. Hunter called its valvular part, and which has been since described as a distinct or middle lobe. The circumstances of

the case being thus rendered evident, the catheter must be passed for the purpose of drawing off the urine. The instrument used here must be much longer and more curved than ordinary. After passing it as far as the bulb, and turning it, the point should be steadily kept in contact with the upper surface of the urethra, by the surgeon depressing, in a greater degree than usual, that part of the instrument which he holds; it is then to be passed onwards in this position; and it is surprising to what an extent, in some cases, it must proceed, before it enters the cavity of the bladder. I have known many young surgeons satisfied, from the extent to which they had introduced the instrument, that it must be in the bladder, and desist from their endeavours to relieve the patient when they had only to push it gently on, in order to accomplish their object. By the mode of proceeding I have described, we raise the point of the catheter over the projecting part of the prostate; and though various other methods of effecting the introduction have been described, they all tend to the same object. In retention of urine from enlarged prostate, it seems in general necessary to draw off the water night and morning, till the bladder has regained its full power. The loss of power which it sustains, is in general commensurate with the degree of distension it has undergone. I have known some persons, who, being subject to retention of urine from diseased prostate, have sent immediately on the recurrence of an attack, for assistance, and the urine being forthwith drawn off, there has been no necessity for the repetition of the operation. In general, however, three weeks elapse before the bladder regains its natural power, for it has commonly suffered from over distension before assistance arrives.

Mr. Hey, of Leeds, made an experiment, to ascertain whether the bladder, when it had suffered from excessive distension, would sooner regain its power by the catheter being left permanently introduced so as to keep it always empty, or by the instrument being passed and the urine drawn off night and morning in the ordinary way. The conclusion to which he came was, that the better practice consisted in passing the catheter and drawing off the urine night and morning. There are cases, however, where the difficulty of introducing the catheter is so great, that it may be better to leave the instrument, than to run the risk of failing to pass it upon a future occasion. Yet the presence of the instrument often causes so much irritation that we are obliged to withdraw it, or arouse its actions in the parts which accomplish its expulsion. I had occasion to introduce the catheter into the bladder of a person labouring under this kind of retention of urine, in whose case the general substance of the prostate was not materially enlarged, but in



whom the third lobe was especially affected, so as to create considerable difficulty in withdrawing the instrument out of the orifice of the bladder. The next time, therefore, when I was to draw off the urine, I introduced a varnished catheter of more than common length, and left it, having warned the patient of the necessity of keeping it in its place. Nevertheless it came out, either expelled by the involuntary action of the urinary organs, or withdrawn in consequence of some movement on the part of the patient. In this case I found myself obliged to puncture the bladder above the pubis. The patient, who resided at a considerable distance from London, lived very comfortably for between two and three years after the operation; when he died of some other complaint.

In the case of retention from enlarged prostate, after continuing for some time to draw off the urine night and morning, we find by degrees that the patient passes an increasing quantity of urine in the intervals, and seems disposed to think that the introduction of the catheter is no longer necessary. To determine this point, we request him to try to empty his bladder as completely as possible, and withdraw into another room that he may be in private. When he thinks he has done so, we introduce the catheter, and, perhaps, draw off half a pint of urine in addition to what he has already passed. This shows that the bladder has not regained its full power; we should, therefore, continue to introduce the instrument till we find that the bladder is capable of expelling nearly the whole of its contents.

§ 26. Retention of urine may arise from debility in the detrusor muscle of the bladder, which will be farther enfeebled by the distension occasioned by an accumulation of urine. If under these circumstances the neck of the bladder also participates in the want of power, the urine will then be expelled by the action of the abdominal muscles, and a dribbling of urine may occur, which is apt to occasion the case to be mistaken for one of incontinence. There is no reasonable hope of the detrusor regaining its power, unless the urine be regularly drawn off night and morning for some time. Occasionally, in consequence, probably, of the sphincter retaining some degree of energy, I have known the bladder become enormously enlarged, occupying the front of the abdomen, and rising even above the umbilicus, though the urine was continually dribbling. There is a case of injury done to the nerves of the bladder, which I have been in the habit of relating in my lectures, as illustrative of the effects produced by a perfectly powerless state of that organ. A young man fell from the top of a house upon his back, and broke his sacrum into many pieces; the *ossa illii* on

either side were likewise broken, but the sacro-iliac symphysis on both sides remained entire. The muscles on the back of the legs and soles of the feet were deprived of all power of motion, those on the front of the thigh still retaining their functions: he could not void his urine, and I was charged with drawing it off night and morning; but upon the second evening, the nurse said to me, "You need not give yourself the trouble of coming, sir, for I can make him discharge his urine when I please." Placing a small chamber-pot in readiness, she applied her fist just above the pubis, and pressed down towards the cavity of the pelvis, and the urine flowed in a stream proportioned to the degree of pressure she employed.

### *Diseases of the Prostate.*

§ 27. The prostate being a gland of low organization, *i. e.* supplied with very small vessels and nerves, is chiefly subject to indolent enlargements of its substance. By slow degrees it often acquires a surprising bulk, being sometimes found as large as a full sized orange; in which case it presses in upon the rectum, flattening the fæces as they are voided; yet it produces no particular uneasiness when the contiguous organs are not in an irritable state, and the disease is principally to be dreaded on account of the impediment it is likely to create to the expulsion of the urine. When the whole substance of the prostate is nearly equally enlarged, there is no diminution in the area of the urethra; but there is a considerable alteration in the curve of the canal, such as has already been described. On this subject it is my chief wish to say, that I have known many considerable enlargements of the prostate greatly reduced by measures tending to soothe the local malady, and to improve the state of the patient's general health. In effecting the latter object, alterative doses of the *pilul. hydrarg.* were indeed used to their fullest extent, only short of that which induces languor or febrile irritation. Given in this way, the mercury acts as a discutient. I have known enlargements of the prostate reduced gradually, by this means, in the same manner as enlargements of glands in any other part of the body.

§ 28. The prostate is liable to have concretions formed in its small cells, when its mucous secretion deviates from the healthy state. These prostatic calculi are of a brown colour, and, passing through the ducts, are discharged with the urine: by degrees the cells and ducts of the prostate are enlarged by the formation and passage of these calculi, which are often discharged in considerable numbers; so that patients will sometimes exhibit a pill-box full of them, which they have collected by degrees. This state of disease has also appeared to me

one admitting of mitigation, and unconnected with any necessary cause for alarm; it is, however, exceedingly difficult to form correct opinions upon the nature and tendencies of the diseases now under discussion, as they are so generally found in combination with disease or irritability of the bladder, rectum, and urethra.

Though the prostate must be allowed to be of an indolent nature, it is nevertheless sometimes the seat of active inflammation and abscess. The abscess may burst into the urethra; or it may make its way outwards, and present beneath the fascia of the perineum, and require to be opened in that direction. These cases are characterized by the situation of the pain, which is increased, if the prostate be examined per anum, by the urgency of the calls to void the urine, and the uneasiness that accompanies the act. All these symptoms are relieved upon the matter being discharged; when the case commonly does well. It may happen, however, that the urine, by getting into the cavity of the abscess, may prevent it from healing: and when urine lodges in this way within the cavity of an abscess now become fistulous, it may deposit calculous concretions, so that at length urinary calculi will be found embedded in the substance of the prostate gland.

§ 29. Without appearing to be materially enlarged, the prostate is liable to secrete a redundance of mucus, which is expelled by pressure in the act of discharging the fæces. Cases of this description appear to me to be susceptible of relief by the same plan of treatment as has just been mentioned. The local affection must be soothed, and tone and tranquillity must be given to the system at large.

### *Diseases of the Urinary Bladder.*

§ 30. In cases of irritable bladder, the lining membrane is generally inflamed, and the urine is mixed with mucous discharges. As distention of the organ causes an increase of uneasiness, there is a frequent desire to void the urine. The muscular coat generally participates in the affection, and the expulsion of the urine is then accompanied with pain. The urine is for the most part discharged first, and the mucus comes away afterwards. The circumstances of mucus and blood being discharged after the urine, seems to imply that they have lodged in the bladder. I have known cases in which blood has been discharged, as I believe, from the prostatic part of the urethra. In these instances the blood came first, the urine afterwards. Sometimes the muscular power of the bladder being affected, it does not act to the extent of its natural contractibility, and a certain portion of urine being detained, the bladder



soon becomes painful from re-distention, so that the necessity for voiding the urine occurs very frequently. In this case it has been proposed to draw off the urine completely, by means of the catheter, with a view to mitigate the patient's suffering. I have known people who suffered long, and died from such a disease as I have described, in the bodies of whom no morbid appearances beyond those just mentioned could be discovered, —the internal coat of the bladder was highly inflamed, but was not ulcerated. I have known cases where the other pelvic visera were disturbed in common with the urinary organs, and to such a degree, as to lead to the belief of their being diseased in some especial manner, yet no morbid appearances could be discovered on the most attentive examination after death. These cases occurred in females, who suffered occasionally from the most tormenting dysury, from tenesmus and irritation in the rectum, some of whom did not menstruate, whilst others were affected with menorrhagia, and discharges from the uterus. I advert to these cases to show that there is some constitutional cause of nervous irritation, or imperfection of function, which operates in maintaining diseases of these organs, singly or generally. In general, the irritable state of the lining of the bladder induces ulceration of its substance. The ulcers are of various kinds, and sometimes produce fungous growths, which are liable to be incrustated with calcareous depositions. Where ulceration of the bladder has taken place, puriform discharges, and blood, which is often coagulated, may be observed in the urine. The recovery of the patient under these circumstances is scarcely to be expected; for the diseased part is continually irritated and injured, at one time by the distention of the bladder, at another by its contraction. It is also subject to be acted on by the acrid qualities of the urine, which, from not being completely expelled, often becomes highly ammoniacal in consequence of chemical decomposition. Reason would suggest to us, under these circumstances, the advantage of introducing and leaving a varnished catheter, so as to keep the bladder entirely at rest, and to wash out its contents occasionally by the injection of poppy water; but so far as I have observed, patients cannot submit to this treatment, the presence of instruments occasioning intolerable irritation.

§ 31. In diseased states of the bladder, the walls of the organ sometimes become exceedingly thickened, so that it remains permanently of small dimensions, incapable of being distended. The injection of mild fluids has been said to do good under these circumstances; but it is certain that even if the bladder could be made to regain its capacity, it would not alter the nature of the disease with which the organ was affected. In proof

of this point I briefly relate the following case :—A gentleman having irritable bladder, and in consequence feeling himself obliged to void his urine at intervals of two hours, and sometimes oftener; was travelling from the north of England in his own carriage, in which he kept an urinal, that he might relieve himself as often as he required it ; on his journey, however, he was seized with retention. As he came to each town of any note, he sent for the surgeon in greatest repute there, who sometimes succeeded in introducing a catheter, and sometimes failed in the attempt. In this state of uncertainty and distress, he approached to within fifty miles of London ; but here no one was found able to introduce the instrument. His bowels were cleared, he was put into the warm bath, and attempts were again made on the following morning to relieve him, but still without success ; he, however, now complained much less of pain than he had formerly done. I saw him in the middle of the following night, and found him slightly delirious, with his bladder distended to the height of his navel. Upon introducing the catheter, a very large wash-hand basin full of urine was drawn off. I came to town with him next day, and afterwards drew off his urine night and morning till he learnt to perform the operation for himself. He was now full of self-congratulation on the comfortable situation in which he found himself, compared with that in which he had been for the last two or three years. During that period, he had been suffering almost continual pain, living in a state of perpetual apprehension, and requiring to pass his urine at the short intervals already mentioned, whilst now he had no uneasiness. However, as the bladder recovered its power of expelling the urine, it became irritable, and subject to pain during its action, as before the retention.

§ 32. The bladder is subject to another affection, characterized by a great discharge of viscid mucus. This disease is known by the name of *catarrhus vesicæ*. Sometimes a quart or more of this mucus may be voided in the course of a single night. The urine being poured off, the mucus appears at the bottom, and is capable of being lifted up in ropes. The disease seems to attack in paroxysms, which gradually subside.

§ 33. Diseases of one of the urinary organs are very apt to be communicated to another : disease of the urethra affects the bladder, and even the kidneys ; and contrariwise, disease of the kidneys affects the bladder and urethra. Where persons have a diseased kidney, it is manifested by a pain in the loins : this may be increased by pressing on the part, and also by motion. I have known instances of purulent matter and blood being discharged with the urine, which came from the kidney, but producing irritation in the bladder, they were supposed to indi-

cate disease of the latter organ. These discharges occur in paroxysms; and in the interval, the bladder performs its functions in a healthy manner,—a circumstance which shows that it is not the seat of disease. Motion, also, produces much irritation in cases where the kidney is affected.

§ 34. Blood is sometimes discharged from the kidney, apparently without any great degree of disease of that organ:—An elderly gentleman, whom I had long known, and who was a very healthy man, told me that he was occasionally subject to such hemorrhages, that they continued for a time, and gradually ceased. He said the first time he was seized he was much alarmed. He had got up to make water as usual, and voided about a quart: on looking at it, it was as red as blood; and after standing, about half of it formed into a coagulum. In this case the blood never coagulated while in the bladder, as it does in other cases, when it occasions considerable irritation, and requires to be washed out, or to have its exit promoted by frequent injection of tepid water through a varnished catheter. This gentleman died at a very advanced age, and in consequence of no apparent renal affection.

§ 35. I knew a gentleman, between 30 and 40 years of age, who had a diseased kidney, and was liable to occasional suppression of urine. He sent to me early one morning, to request I would draw off his urine, as the urgency he felt to empty his bladder was intolerable. The bladder, however, could not be felt above the pubis, so that I was inclined to think he was mistaken in the nature of his case. He nevertheless urged the introduction of an instrument; and not knowing whether his urethra was sound or otherwise, I thought it right in the first instance to introduce a full sized bougie, which passed without the slightest difficulty. He then discharged in a full stream about ten ounces of healthy pus. For some time his urine continued to be mixed with pus; this, however, gradually ceased; and he lived for many years afterwards, and died at last from suppression of urine.

§ 36. Concerning the treatment of diseases of the kidney, which have been manifested by sensations and occurrences such as I have described, I may mention that I have known them relieved, and, indeed, subdued and made perfectly quiet, by an issue, established and kept open opposite to the diseased kidney; in conjunction, however, with repose, the horizontal posture, and the plan of medical treatment which I shall proceed to recommend.

§ 37. In tracing all diseases of the urinary organs from local irritation, occurring accidentally in gonorrhœa, as is very commonly done, I am persuaded we take a very partial and very



prejudicial view of these affections. One person has gonorrhœa, which subsides in the usual manner, and within the usual time; others, again, have the disease prolonged, and suffer such consequences as have already been described. But there are constitutional causes which operate in prolonging and aggravating the local malady, and which lead to the establishment of diseases that continue long after the gonorrhœa has ceased. There are persons who suffer from those diseases in their most aggravated form, which are usually regarded as the effects of gonorrhœa, and who never were affected with that complaint, nor any other locally exciting cause. Dysury is a constitutional malady, affecting persons at all periods of life, and of both sexes. It often occurs in childhood; and though we rarely meet with strictures in early life, I have still known several instances of their occurrence, one of which I shall relate. A lad between 14 and 15 years of age was brought into St. Bartholomew's Hospital, whose urethra had sloughed behind a very remote stricture. The skin of the perineum, scrotum, and penis, was injected with urine, and subsequently sloughed in many places. An ample incision was made in the perineum, so as to expose the open part of the urethra; and through this the patient voided his urine in a full stream and without pain. When the sloughs had separated, and the integuments had recovered from the inflammation they had undergone, a soft bougie could be passed from the wound in the perineum into the bladder; yet the anterior part of the urethra contained so many greatly indurated and contracted strictures, that a whole year elapsed before we could pass a varnished catheter down to the wound in the perineum, and onwards into the bladder, so as to permit the opening to heal up.

I feel convinced that diseases of the urinary organs are generally of a secondary nature; being occasioned and kept up by primary disorders of the system in general, and of the digestive organs in particular. Indigestion is a cause of the unhealthy qualities of the urine, which render it stimulating to the organs that receive it, and through which it must flow. Granting that morbid actions of the kidney itself might produce such or similar effects, still, as the renal nerves have their origin in common with those of the other abdominal viscera, it is likely that the kidney will participate in the diseases of the alimentary organs; and, indeed, we know that the nervous irritation which so frequently results from disorder of the digestive organs, will prove a source of disturbance to the kidney and urinary organs in common. Stomachic irritation, however, probably operates upon the urinary organs in a more direct manner; for certain substances taken into the stomach produce immediate relief in

cases of dysury. I have seen a patient, who, for hours, has been pacing his chamber, and making an attempt every five or ten minutes to void his urine, receive sudden and complete relief by taking a little ammonia in warm water. The tinct. ferri muriatis, given in such a dose as to excite nausea, has also relieved retention of urine, when a variety of other measures had failed. But one of the most striking illustrations of the intimate sympathy that exists between the stomach and urinary organs occurred in the case of a patient whom I was attending for a very irritable stricture in his urethra. It repeatedly happened to this gentleman that, having sat down to dinner, quite at his ease, and without any expectation of an attack of irritation in his urethra and bladder, he had no sooner swallowed a few mouthfuls of food, than a fit came on, which compelled him to retire to his chamber, and have recourse to tepid bathing of the perineum; a measure from which he derived so much advantage at all times, that he had constantly a supply of hot water in readiness. It is further to be remarked, and is moreover evident in many cases, that irritation in the lower bowels disturbs the pelvic nerves, and affects the urinary organs in an especial degree.

From all I have observed in regard to diseases of the urinary organs, I should place my chief reliance, in every attempt at remedying them, on that strict attention to diet which enables the stomach thoroughly to digest the food that is taken, together with the regulation of the functions of the other alimentary organs in the manner suggested in the first part of my *Surgical Observations*. I have seen great relief derived from such measures; and in one instance a most unexpected cure obtained by their adoption. A gentleman who was thought to be dying from disease of his bladder, and who had consulted many surgeons of eminence, came to London to ask advice of Sir E. Home and myself. Neither of us had the least doubt of his having ulcers in his bladder; for he voided his urine very frequently, and after it regularly discharged both pus and blood; so that we were both inclined to regard the case as one which could not be expected to recover. I, however, told the patient my notions of the benefit to be obtained by exactly proportioning the quantity of food to the powers of the digestive organs, so as to leave no surplus of alimentary matter at liberty to ferment and corrupt in the chylopoietic viscera. About seven or eight years afterwards, a gentleman was speaking of a famous trotting mare which he possessed, and added:—"By the way, I bought her of a patient of yours, who told me he had himself trotted her at a surprising rate, a circumstance at which I was perfectly astonished; for I remember, when he went up to Lon-

don to consult you, nobody ever expected that he would return alive. Expressing my surprise at his recovery, he said to me, 'Ah, sir, I deserve to be well : no one, I believe, but myself, would have weighed his food, and taken it according to rule, as I did for a considerable number of years.' " I saw this patient some years afterwards ; for he came to town to consult me about irregular actions of his heart, and he then continued free from any affection of the urinary organs. Though strongly impressed with a belief in the efficacy of the above mode of treatment, I readily acknowledge the benefits to be derived from additional measures. If there be acidity in the stomach, or redundant acids in the urine, alkalies to neutralize them are beneficial. It is, however, wrong to give these medicines in such doses as will destroy the predominance of phosphoric acid in the urine, as this is necessary to keep the lime in solution. Observation also shows, that small doses of alkaline substances relieve irritation of the urinary organs, whilst larger doses have a contrary effect. Turpentine, the balsams, as that of Capivi, and ether, seem both to excite the functions of the kidney, and to contribute to the tranquillity of the urinary organs. These substances appear to be thrown out of the circulation by the kidney, and the impregnation which they give to the urine may have a beneficial effect upon the organs that contain it. A sudden change in the quality of the urine is often observable upon these medicines being taken. In like manner the *uva ursi* is found impregnating the urine ; and the benefit derived from the use of this medicine may either result from its local operation on the bladder, or from its action on the stomach, and consequent sympathetic effect on the urinary organs. This medicine has of late years been eulogized in cases of discharges from the mucous membrane of the lungs.

Though I know of no practical inference to be drawn from the cases which I proceed briefly to mention, and which are of very rare occurrence, yet it seems right to record, that some persons have voided numbers of what seemed to be very small worms in their urine, and that hair has also been known to be discharged with that fluid. From the bladder of one lady who had calculi, which I removed by the common operation of lithotomy, I afterwards extracted a large matted mass of hair, consolidated by calculous deposition. The entanglement by this hair of the animal matter in the urine, and its consequent putrefaction, occasioned that fluid to be at all times extremely fetid prior to the operation. This fetor ceased afterwards ; nor did I hear that any more hair was subsequently discharged. Between two and three years afterwards the lady again complained of symptoms of stone. On examination a calculus was discovered,



and got rid of, whilst it was of a small size, by dilating the urethra. With regard to the discharge of worms, or substances resembling worms, with the urine, I think it worth while to mention, that patients have brought to me such substances, which they affirmed they had voided by the urethra. These supposed animalculæ were small, apparently composed of rings, and pointed at both ends. They caused no particular disturbance, except at the time of passing; they occasionally came away in great quantities; at other times, however, none were detected in the urine. The character and station in life of some of these patients precluded the supposition that they had deceived themselves, or had a desire to deceive others.

### *Hydrophobia.*

From speaking of the agency of morbid poisons, I have been led into a long digression; for, after describing their effects on the urinary organs, I have proceeded to treat of the diseases of those organs in general; but these subjects are so intimately connected, that it would have been difficult to avoid this mode of proceeding. There is but one other poison that requires attention which may be considered as strictly surgical: this is the poison derived from rabid animals. This poison seems to be produced by the canine species alone; for though it has been communicated by the bite of a cat, still it is well ascertained, in almost every instance, that this animal was bitten by a dog, previously to the appearance of any symptoms of disease. Animals, when affected by this poison, appear irritable, despondent, and subject to difficulty of deglutition, which is chiefly brought on by an attempt to take liquids; varieties occur, however, in regard to the latter symptom. The poison of hydrophobia is usually communicated by a bite, and it has been supposed that the saliva is possessed of the morbid qualities. Of late it has been affirmed that there are small pustules to be observed under the tongue, which, it has been supposed, might produce the infectious fluid. The poison of hydrophobia does not appear to have any locally stimulating properties; for the bites by which it has been communicated heal as readily as such wounds do in cases where there is no poison. No inflammation occurs in the bitten part when symptoms of hydrophobia, which usually supervene about three weeks after the receipt of the bite, first appear, although in general uneasiness is felt in it, extending towards the trunk of the body, prior to the occurrence of the constitutional disease. Many persons, however, who had no suspicion that the animal was rabid by which they were bitten, have remained well, and ignorant of having any disease about them, until the moment when constitutional symp-

toms came on. In comparing the effects of this poison with what we know relative to others, we have to inquire whether, if there be a poison, it is imbibed from the wound soon after its application, and a time elapses between its reception into the circulation and the occurrence of its specific effects; or whether it lodges in the part to which it has been applied, and being afterwards absorbed, exerts its peculiar influence as soon as it is taken into the circulating fluids. The truth of the latter opinion was strongly impressed on my mind by the following case, which occurred during my apprenticeship:—A very fine lad, about 14 years of age, was bitten in the finger by a rabid dog, and being brought to St. Bartholomew's Hospital, caustic was applied to the wound very freely, so that considerable sloughing of the integuments, and even inflammation of the subjacent sinewy parts, followed. He suffered severely from this treatment; but by soothing measures, local and general, he gradually got better, and the wound began to heal. Seeing him one day, about three weeks after the bite, with the sore uncovered, I told him it gave me pleasure to see his wound getting well. He answered that it was healing, but that he had some odd pains about it which ran up his arm; and, on uncovering the fore-arm, I observed two red lines extending up it, such as denote irritation in the absorbent vessels. I went to the hospital early in the following morning, as if to visit another patient in the same ward, and as I was going out, I said to this youth, "I hope you have lost all that uneasiness you were speaking of yesterday." He replied, that he had, but that he had felt very unwell during the night. I asked to look at his tongue, which was furred; and, feeling his pulse, I remarked that he was slightly feverish, and inquired whether he did not feel thirsty; he answered in the affirmative, and I told the nurse she should have given him some toast and water, and desired that he might have a little now. He seemed inclined to drink; but when the fluid was presented to him, and he made the attempt, he shuddered, and put it away. This fine and intelligent youth did not survive more than two days from this time. As I always mentioned this case in my lectures, the question about the period of absorption and infection of the poison was made the subject of experiment; and, as far as these experiments have been prosecuted, they tend to show that if the bitten part be removed before changes which precede the appearance of constitutional symptoms take place, hydrophobia does not occur. That the saliva of rabid animals is morbid, or at least has morbid matter commixed with it, is made probable from the following case:—A servant maid was accustomed to feed a small pet spaniel, which was bitten by a dog not supposed to be mad. The spaniel, however,



became affected with rabies, and at length died of the disease. Though he refused food and drink, ate the straw which served him for a bed, and snapped at other persons who approached him, yet he never betrayed any peculiarity of conduct to the girl who was accustomed to feed him; on the contrary, he licked her hand as he used to do. This was in the winter season, when the poor girl's hands were severely chapped, and the surface of the sores was in a raw and exposed state. About three weeks after the death of the dog, this girl had the constitutional symptoms of hydrophobia, for which she was admitted into an hospital, where she died.

It appears, then, to me to be the duty of a surgeon, in the case of a person bitten by an animal suspected to be rabid, carefully to cut away all that portion of animal substance with which the tooth of the animal could have come into contact. If this be effected, I believe we may entertain considerable hopes of the security of the patient, even though several days have elapsed since the receipt of the injury. I have done the operation five or six days after persons were bitten, in consequence of the dog having died, and the stomach being found, on subsequent examination, spotted in places, and containing straw and chips; circumstances which satisfied me that the animal was rabid. We are not, however, warranted in drawing decisive conclusions from such premises; because a rabid dog has been known to run through a town and to bite many persons, very few of whom have had constitutional symptoms. When the bite is inflicted through the clothes, the saliva may be wiped off the teeth by the garments. It is, therefore, wounds of exposed parts that ought to excite our greatest apprehensions. The application of caustic, however liberally used, offers no security against inoculation in these cases. Fontana, who performed so many experiments upon animals bitten by the viper, applied the caustic without avail, whilst he succeeded in preventing contamination by excising the part. The excision of the bitten parts seems to me no very formidable operation: the trefoil-shaped incisors merely abrade the surface of the skin, and any saliva that may have been applied to a wound of this description may be washed away. The canine teeth, or tusks, are the chief inoculating instruments. It has been proposed to fill the cavities which these teeth have made with ink, to let this dry, and then to wash till all colour was removed, which would be a test of complete ablution. I regret much that it never occurred to me to try the effect of ablution with water impregnated with chlorine; but I have adverted to the powers of this substance in destroying the infectious properties of variolous matter, as ascertained by Dr. Rollo and Mr. Cruikshanks. Should expe-



rience show that it has the power of destroying the infectious property of the poison I am now speaking of, then the holes made by the cuspidated teeth of the dog might be merely laid open and washed to the bottom. I have, however, been in the habit of excising the wounded parts in the following manner :— I have taken a bit of wooden skewer, and shaped the end of it so as to represent the tusk of a dog. This, I have then worked into the cell made by the tooth, till I thought I had gone completely to the bottom, when I have proceeded to cut out the skin, cellular substance, &c. containing the skewer. If it appeared to me afterwards that there was no communication from below with the cavity containing the skewer, I felt satisfied that I had removed the whole of the substance with which the tooth of the animal could have come in contact, or to which the saliva could have been applied.

With respect to constitutional symptoms I have to observe, that there is no particular febrile excitement; that the disease is chiefly characterized by extreme nervous irritation and despondency, and by an affection of those muscles which seem to be most under the influence of the mind, as those of deglutition, and the diaphragm. That the digestive organs are also affected is evident; and little hope can be entertained of doing much good to these viscera, where people are, for the most part, incapable of taking the requisite medicines. Mr. Hunter was in the habit of relating an incident in his lectures, to show the extreme irritability of persons affected with hydrophobia: it was that of an unfortunate gentleman, who became almost frantic with passion, and incapable of revealing the cause of his anger till it was in a degree exhausted by his own violence, when it was found to have arisen from some one not having offered him a pinch of snuff, when he wished for it.

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I HAVE thus presented the reader with a sketch of those evening lectures which I have been accustomed to deliver, under the title of "A Course of Lectures on the Theory and Practice of Surgery." Yet all who attended them were fully apprized that they were not designed as a complete series of Surgical Lectures, but merely as an appendage to, and containing that part of surgery which could not be incorporated in the anatomical course. When I first began to give lectures, I adopted a plan of instruction prevalent among the teachers of this metropolis. They taught in conjunction natural structure and

*Higgins*

function, and connected these with the study of morbid functions, and those alterations of structure which they produce. This plan seemed best adapted to communicate to students, in the briefest manner, the indispensably requisite extent of professional knowledge. These subjects also are so intimately connected, and so continually illustrative of each other, that they cannot properly be separated. Many circumstances relative to natural structure, that cannot be demonstrated by the most subtle anatomical artifices, are evinced by diseases. By teaching these subjects in this manner, the knowledge of each is kept alive in the memory by association. We cannot think of the natural structure of parts without calling to mind their healthy functions, and the diseases to which they are liable; nor can we think of unhealthy structures without adverting to the morbid processes which produced them, and contrasting these with the structure and function of parts in health. Indeed, we learn anatomy and physiology chiefly for the purpose of understanding diseases; and this ultimate object of our studies being kept in view, during the whole period of their prosecution, the dulness of acquiring elementary knowledge is dissipated, and even the detail of anatomical facts is rendered interesting. Not only reason but experience also has convinced me that this is the best mode of teaching the groundwork of medical science; which is, however, of such great extent, that if we desire particular information in any of its departments, we must study these more especially: thus we attend lectures on medicine, or on surgery; even the diseases of each organ may be made a distinct object of observation and inquiry. Yet sound views on particular parts of such a subject as the healing art can only follow from a previous acquaintance with its principles at large; for the general structures and functions of all the organs of the body, and the means of allaying, exciting and modifying their actions, are influenced by the same laws. According to this plan of teaching, the nature of surgical diseases of all parts of the body, with their respective treatment, is included in the anatomical course. The operations of surgery are also spoken of in that course. Though desirous of publishing my opinions on all those points of Surgery which have been surreptitiously published, yet I do not feel myself warranted in extracting the surgery from the anatomical lectures, and thus making it a separate publication. In the lectures now published, some few have, however, been added from the anatomical course, in order to complete the subjects under discussion, whilst others have been left out, as incompatible with the present arrangement.